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POLYNUCLEOTIDE POPULATION ISOLATED FROM NON-METASTATIC AND METASTATIC BREAST TUMOR TISSUES

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority under 35 U.S.C. § 119(e) to the following U.S. Provisional Application Nos.: 60/090,039; 60/090,040; 60/090,041; 60/089,853; and 60/089,997, each filed June 19, 1998, the contents of which are hereby incorporated by reference into the present disclosure.

TECHNICAL FIELD

This invention is in the field of genetic analysis. Specifically, the invention relates to the isolation of polynucleotides that are differentially expressed in primary or metastatic breast cancer. The compositions and methods of the present invention are particularly useful in diagnoses, prognoses and/or treatment of breast cancer.

BACKGROUND OF THE INVENTION

In spite of numerous advances in medical research, cancer remains the second leading cause of death in the United States. In the industrialized nations, roughly one in five persons will die of cancer. Traditional modes of clinical care, such as surgical resection, radiotherapy and chemotherapy, have a significant failure rate, especially for solid tumors. Failure occurs either because the initial tumor is unresponsive, or because of recurrence due to regrowth at the original site and/or metastases.

Breast cancer is one of the most common cancers and is the third leading cause of death from cancers in the United States with an annual incidence of about 180,200 new cases among women in the United States

during 1997. About 1,400 new cases of breast cancer will be diagnosed in men in 1997. In industrialized nations, approximately one in eight women can expect to develop breast cancer. The overall mortality rate for breast cancer has remained unchanged since 1930. It has increased an average of 0.2% per year, but decreased in women under 65 years of age by an average of 0.3% per year. Preliminary data suggest that breast cancer mortality may be beginning to decrease, probably as a result of increased diagnoses of localized cancer and carcinoma *in situ*. See e.g., Marchant (1994) Contemporary Management of Breast Disease II: Breast Cancer, in: *Obstetrics and Gynecology Clinics of North America* **21**:555–560; and Colditz (1993) *Cancer Suppl.* **71**:1480–1489. An estimated 44,190 deaths (43,900 women, 290 men) in 1997 will occur due to breast cancer. The five-year survival rate for localized breast cancer has increased from 72% in the 1940s to 97% today. If the cancer has spread regionally, however, the rate is 76%, and for women with distant metastases the rate is 20%. Survival after a diagnosis of breast cancer continues to decline beyond five years. Sixty-five percent of women diagnosed with breast cancer survive 10 years and 56% survive 15 years.

Thus, despite an ongoing improvement in our understanding of the disease, breast cancer has remained resistant to medical intervention. Most clinical initiatives are focused on early diagnosis, followed by conventional forms of intervention, particularly surgery and chemotherapy. Such interventions are of limited success, particularly in patients where the tumor has undergone metastasis. There remains a considerable need in the art for developing diagnostic methods to monitor or prognose the progression of the disease. There also exists a pressing need to improve the arsenal of therapies available to provide more precise and more effective treatment in a less invasive way.

Tumor formation is a multi-step process where aberrant cells progressively accrue genetic mutations that confer a growth advantage or survival benefit. For example, cancer cells from metastatic lesions have been found to be more aggressive with respect to their rate of growth and capacity to invade other tissues as compared to cancer cells derived from primary

tumors. It is known that genotypic alterations contribute to the aggressive phenotype of metastatic tumor cells. Due to the vast variability in the nature of the genotypic alterations, the identification of genes preferentially expressed in either non-metastatic breast tumor cells or metastatic breast cells has been difficult. Undoubtly, an exhausted search for such genes have considerable value in both the diagnosis of breast cancer as well as in devising new therapeutic strategies to combat this disease.

DISCLOSURE OF THE INVENTION

The present invention addresses these and certain other deficiencies in the prior art in having isolated and characterized a population of polynucleotides corresponding to genes or transcripts that are differentially expressed or transcribed in either non-metastatic or metastatic breast tumor cells. Transcripts that are overexpressed in the non-metastatic breast tumor such as a primary tumor may encode factors that restrict tumor cell growth such as tumor suppressors, pro-apoptotic factors, inhibitory growth factors or molecules that engage in immune recognition. Transcripts that are preferentially expressed in metastatic tumor tissue may encode factors that augment tumor cell growth or confer a survival benefit such as oncogenes, stimulatory growth factors, anti-apoptotic factors or immunosuppressive factors. These populations of polynucleotides associated with the non-metastatic or metastatic state of a breast cell are particularly useful in the diagnoses and the development of therapeutics for metastatic breast cancer.

Accordingly, the present invention provides a method for aiding in the diagnoses of the metastatic condition of a breast cell by determining differential expression of a polynucleotide that is associated with breast cancer progression. In one aspect, the differential expression is characterized by over expression of a polynucleotide having the sequence selected from the group set forth in Table 1, or the encoded polypeptide. In another aspect, the differential expression is characterized by under-expression of a polynucleotide having the sequence selected from the group set forth n Table 2, or the encoded polypeptide.

Another embodiment of the invention is a screen for a potential therapeutic agent that modulates the expression of a polynucleotide associated with the metastatic condition of a breast tumor cell. The method involves contacting a cell with an effective amount of a potential agent, and assaying for a change in expression level of a polynucleotide selected from the group identified in Tables 1 and 2, wherein a change in the expression level is indicative of a candidate therapeutic agent. The potential therapeutic agent can be, but is not limited to, an antisense oligonucleotide, a ribozyme, a ribozyme derivative, an antibody, a liposome, a small molecule, or an inorganic compound.

Yet another embodiment of the invention is a method of reversing the metastatic condition of a breast cell, wherein the cell is characterized by differential expression of polynucleotides of the invention. In the method, a cell is contacted with an agent identified by the above-mentioned method. Still yet another embodiment of the invention is a method of modulating the genotype and/or phenotype of a breast cell by introducing the cell a polynucleotide of the present invention. In one embodiment a polynucleotide or regulatory sequence identified to inhibit the metastatic potential of the tumor cell is introduced into the cell.

The present invention also provides isolated polynucleotides and populations of the isolated polynucleotides that identify a non-metastatic or a metastatic breast tumor cell. The polynucleotides are intended to include DNA, cDNA, RNA and genomic DNA. Expression systems, including gene delivery vehicles such as liposomes, plasmids and viral vectors, and host cells containing the polynucleotides are further provided by this invention.

Further provided are promoter sequences derived from the tags represented in either of Tables 1 or 2.

Additionally, the invention includes nucleic acid probes and primers that hybridize to invention polynucleotides, as well as isolated nucleic acids comprising novel, expressed gene sequences containing these polynucleotides. The present invention also provides polypeptides and proteins encoded by the polynucleotides.

The present invention further provides antisense oligonucleotides, antibodies, hybridoma cell lines and compositions containing the same.

Further provided are polynucleotides that correspond to regulatory sequence to enhance or inhibit of downstream polynucleotides. The regulatory sequences can be inserted upstream of polynucleotides encoding therapeutic genes.

Also provided are databases of sequences cataloging polynucleotides differentially expressed in non-metastatic or metastatic breast cells and methods of using the sequences to identify and analyze genes expressed in a test cell. In one aspect, the sequences are downregulated in a metastatic breast cell and comprises at least one polynucleotide selected from the group identified in Table 2, and their respective complements in a computer readable form. In another aspect, the database of sequences characterizes a metastatic breast cell and contains at least one polynucleotide selected from the group identified in Table 1, and their respective complements in a computer readable form.

BRIEF DESCRIPTION OF THE SEQUENCE LISTING

Sequence ID Numbers 1 through 3175 depict the tags corresponding to distinct transcripts that are preferentially transcribed in the metastatic breast tumor tissue.

Sequence ID Numbers 3176 through 5911 depict the tags corresponding to distinct transcripts that are preferentially transcribed in the primary or non-metastatic breast tumor tissue.

MODE(S) FOR CARRYING OUT THE INVENTION

Throughout this disclosure, various publications, patents and published patent specifications are referenced by an identifying citation. The disclosures of these publications, patents and published patent specifications are hereby incorporated by reference into the present disclosure to more fully describe the state of the art to which this invention pertains.

Definitions

The practice of the present invention will employ, unless otherwise indicated, conventional techniques of immunology, molecular biology, microbiology, cell biology and recombinant DNA. These methods are described in the following publications. See, *e.g.,* Sambrook et al., MOLECULAR CLONING: A LABORATORY MANUAL, 2nd edition (1989); CURRENT PROTOCOLS IN MOLECULAR BIOLOGY (F. M. Ausubel, et al. eds., (1987)); the series METHODS IN ENZYMOLOGY (Academic Press, Inc.); "PCR: A PRACTICAL APPROACH" (M. MacPherson et al., IRL Press at Oxford University Press (1991)); PCR 2: A PRACTICAL APPROACH (M.J. MacPherson, B.D. Hames and G.R. Taylor eds. (1995)); ANTIBODIES, A LABORATORY MANUAL (Harlow and Lane, eds. (1988)); and ANIMAL CELL CULTURE (R.I. Freshney, ed. (1987)).

As used in the specification and claims, the singular form "a", "an" and "the" include plural references unless the context clearly dictates otherwise. For example, the term "a cell" includes a plurality of cells, including mixtures thereof.

The term "comprising" is intended to mean that the compositions and methods include the recited elements, but not excluding others. "Consisting essentially of" when used to define compositions and methods, shall mean excluding other elements of any essential significance to the combination. Thus, a composition consisting essentially of the elements as defined herein would not exclude trace contaminants from the isolation and purification method and pharmaceutically acceptable carriers, such as phosphate buffered saline, preservatives, and the like. "Consisting of" shall mean excluding more than trace elements of other ingredients and substantial method steps for administering the compositions of this invention. Embodiments defined by each of these transition terms are within the scope of this invention.

The terms "polynucleotide" and "oligonucleotide" can be used interchangeably, and refer to a polymeric form of nucleotides of any length, either deoxyribonucleotides or ribonucleotides, or analogs thereof.

Polynucleotides may have any three-dimensional structure, and may perform any function, known or unknown. The following are non-limiting examples of polynucleotides: a gene or gene fragment, exons, introns, messenger RNA (mRNA), transfer RNA, ribosomal RNA, ribozymes, cDNA, recombinant polynucleotides, branched polynucleotides, plasmids, vectors, isolated DNA of any sequence, isolated RNA of any sequence, nucleic acid probes, and primers. A polynucleotide may comprise modified nucleotides, such as methylated nucleotides and nucleotide analogs. If present, modifications to the nucleotide structure may be imparted before or after assembly of the polymer. The sequence of nucleotides may be interrupted by non-nucleotide components. A polynucleotide may be further modified after polymerization, such as by conjugation with a labeling component.

The polynucleotides can be both double- and single-stranded molecules. Unless otherwise specified or required, any embodiment of the invention described herein that is a polynucleotide encompasses both the double-stranded form and each of two complementary single-stranded forms known or predicted to make up the double-stranded form.

A "gene" refers to a polynucleotide containing at least one open reading frame that is capable of encoding a particular protein after being transcribed and translated.

A "gene product" refers to the amino acid (*e.g.*, peptide or polypeptide) generated when a gene is transcribed and translated.

As used herein a second polynucleotide "corresponds to" another (a first) polynucleotide if it is related to the first polynucleotide by any of the following relationships:

1) The second polynucleotide comprises the first polynucleotide and the second polynucleotide encodes a gene product.
2) The second polynucleotide is 5' or 3' to the first polynucleotide in cDNA, RNA, genomic DNA, or fragment of any of these polynucleotides. For example, a second polynucleotide may be a fragment of a gene that includes the first and second polynucleotides. The first and second polynucleotides are related in

that they are components of the gene coding for a gene product, such as a protein or antibody. However, it is not necessary that the second polynucleotide comprises or overlaps with the first polynucleotide to be encompassed within the definition of "corresponding to" as used herein. For example, the first polynucleotide may be a fragment of a 3' untranslated region of the second polynucleotide, for example a promoter sequence. The first and second polynucleotide may be fragment of a gene coding for a gene product. The second polynucleotide may be an exon of the gene while the first polynucleotide may be an intron of the gene.

3) The second polynucleotide is the complement of the first polynucleotide.

The "genotype" of a cell refers to the genetic makeup of the cell and/or its gene expression profile. Modulation of the genotype of a cell can be achieved by introducing additional DNA or RNA either as episomes or as an integral part of the chromosomal DNA of the recipient cell. The genotype can also be modulated by altering the expression level, e.g. mRNA abundance, of a particular gene using agents that regulate gene expression.

A "sequence tag" or "tag" or "SAGE tag" is a short sequence, generally under about 20 nucleotides, that occurs in a certain position in messenger RNA. The tag can be used to identify the corresponding transcript and gene from which it was transcribed. A "ditag" is a dimer of two sequence tags.

A "database" denotes a set of stored data which represent a collection of sequences including nucleotide and peptide sequences, which in turn represent a collection of biological reference materials.

A "probe" is any biochemical labeled with radioactive isotopes or tagged in other ways for ease in identification. A probe is used to identify or isolate a gene, a gene product, or a protein. Examples of probes include, but are not limited to, a radioactive mRNA hybridizing with a single strand of its DNA gene, a DNA or cDNA hybridizing with its complementary region in a chromosome, or a monoclonal antibody combining with a specific protein.

A "promoter" is a region on a DNA molecule to which an RNA polymerase binds and initiates transcription. In an operon, the promoter is usually located at the operator end, adjacent but external to the operator. The nucleotide sequence of the promoter determines both the nature of the enzyme that attaches to it and the rate of RNA synthesis.

A "primer" is a short polynucleotide, generally with a free 3' -OH group, that binds to a target or "template" potentially present in a sample of interest by hybridizing with the target, and thereafter promoting polymerization of a polynucleotide complementary to the target.

The terms "polypeptide", "peptide" and "protein" are used interchangeably herein to refer to polymers of amino acids of any length. The polymer may be linear or branched, it may comprise modified amino acids, and it may be interrupted by non-amino acids. The terms also encompass an amino acid polymer that has been modified; for example, disulfide bond formation, glycosylation, lipidation, acetylation, phosphorylation, or any other manipulation, such as conjugation with a labeling component. As used herein the term "amino acid" refers to either natural and/or unnatural or synthetic amino acids, including glycine and both the D or L optical isomers, and amino acid analogs and peptidomimetics.

As used herein, the term "isolated" means separated from constituents, cellular and otherwise, in which the polynucleotide, peptide, polypeptide, protein, antibody, or fragments thereof, are normally associated with in nature. As is apparent to those of skill in the art, a non-naturally occurring the polynucleotide, peptide, polypeptide, protein, antibody, or fragments thereof, does not require "isolation" to distinguish it from its naturally occurring counterpart. In one embodiment, an "isolated" polynucleotide is separated from the 5' and 3' non-coding but contiguous sequences with which it is normally associated with in nature. In addition, a "concentrated", "separated" or "diluted" polynucleotide, peptide, polypeptide, protein, antibody, or fragments thereof, is distinguishable from its naturally occurring counterpart in that the concentration or number of molecules per volume is greater than "concentrated" or less than "separated" than that of its naturally occurring

counterpart. A polynucleotide, peptide, polypeptide, protein, antibody, or fragments thereof, which differs from the naturally occurring counterpart in its primary sequence or for example, by its glycosylation pattern, need not be present in its isolated form since it is distinguishable from its naturally occurring counterpart by its primary sequence, or alternatively, by another characteristic such as glycosylation pattern. Thus, a non-naturally occurring polynucleotide is provided as a separate embodiment from the isolated naturally occurring polynucleotide. A protein produced in a bacterial cell is provided as a separate embodiment from the naturally occurring protein isolated from a eucaryotic cell in which it is produced in nature.

As used herein, "expression" refers to the process by which polynucleotides are transcribed into mRNA and/or the process by which the transcribed mRNA (also referred to as "transcript") is subsequently being translated into peptides, polypeptides, or proteins. The transcripts and the encoded polypeptides are collectedly referred to as gene product. If the polynucleotide is derived from genomic DNA, expression may include splicing of the mRNA in an eukaryotic cell.

"Differentially expressed" or "differential expression", as applied to nucleotide sequence or polypeptide sequence in a cell or a tissue, refers to overexpression or underexpression of that polynucleotide when compared to that expressed in a control cell or tissue. Underexpression also encompasses absence of expression of a particular polynucleotide as evidenced by the absence of detectable expression in a tested sample when compared to a control. The selection of the appropriate control cell or tissue is dependent on the sample cell or tissue initially selected and the phenotype of the sample that is under investigation. For instance, if the sample cell is a non-metastatic cell derived from a primary tumor, one or more counterparts or metastatic cells of the sample cell can be used as control cells. Counterparts would include, for example, cell lines established from the same or related cells to those found in the sample cell population. For example, the control cell can be any of a counterpart benign cell type, a counterpart non-metastatic cell type.

A gene or transcript is associated with "breast cancer progression" if it yields transcription or translation products at a substantially altered level or in a substantially altered form in cells derived from metastatic breast tumor tissues as compared with cells of a control tissue, and which may play a role in breast tumor metastasis. The gene or transcript can be a normally quiescent gene that becomes activated (such as a dominant cancer-causing gene); it may be a gene that becomes expressed at an abnormally high level; it may be a gene that becomes mutated to produce a variant phenotype; it may be a gene that becomes expressed at an abnormally low level (such as a cancer suppresser gene); or it may be a gene exhibiting differential expression, in which the differential expression correlates with tumor metastasis.

A "polymerase chain reaction" ("PCR") is a reaction in which replicate copies are made of a target polynucleotide using a "pair of primers" or a "set of primers" consisting of an "upstream" and a "downstream" primer, and a catalyst of polymerization, such as a DNA polymerase, and typically a thermally-stable polymerase enzyme. Methods for PCR are well known in the art, and taught, for example in MacPherson et al., (1991) and (1995), *supra*. All processes of producing replicate copies of a polynucleotide, such as PCR or gene cloning, are collectively referred to herein as "replication." A primer can also be used as a probe in hybridization reactions, such as Southern or Northern blot analyses.

"Hybridization" refers to a reaction in which one or more polynucleotides react to form a complex that is stabilized via hydrogen bonding between the bases of the nucleotide residues. The hydrogen bonding may occur by Watson-Crick base pairing, Hoogstein binding, or in any other sequence-specific manner. The complex may comprise two strands forming a duplex structure, three or more strands forming a multi-stranded complex, a single self-hybridizing strand, or any combination of these. A hybridization reaction may constitute a step in a more extensive process, such as the initiation of a PCR reaction, or the enzymatic cleavage of a polynucleotide by a ribozyme.

Hybridization reactions can be performed under conditions of different "stringency". In general, a low stringency hybridization reaction is carried out at about 40 °C in 10 X SSC or a solution of equivalent ionic strength/temperature. A moderate stringency hybridization is typically performed at about 50 °C in 6 X SSC, and a high stringency hybridization reaction is generally performed at about 60 °C in 1 X SSC.

When hybridization occurs in an antiparallel configuration between two single-stranded polynucleotides, the reaction is called "annealing" and those polynucleotides are described as "complementary". A double-stranded polynucleotide can be "complementary" or "homologous" to another polynucleotide, if hybridization can occur between one of the strands of the first polynucleotide and the second. "Complementarity" or "homology" (the degree that one polynucleotide is complementary with another) is quantifiable in terms of the proportion of bases in opposing strands that are expected to form hydrogen bonding with each other, according to generally accepted base-pairing rules. A polynucleotide that is 100% complementary to a second polynucleotide is understood to be "complements" of each other.

"Tumor" or "cancer" comprises a localized population of proliferating cells in an animal that are not governed by the usual limitation of normal growth. The tumor is said to be benign if it does not undergo metastasis and malignant if it undergoes metastasis. A metastatic cell or tissue means that the cell can invade and destroy neighboring body structures.

A "composition" is intended to mean a combination of active agent and another compound or composition, inert (for example, a detectable agent or label) or active, such as an adjuvant.

A "pharmaceutical composition" is intended to include the combination of an active agent with a carrier, inert or active, making the composition suitable for diagnostic or therapeutic use *in vitro*, *in vivo* or *ex vivo*.

As used herein, the term "pharmaceutically acceptable carrier" encompasses any of the standard pharmaceutical carriers, such as a phosphate

buffered saline solution, water, and emulsions, such as an oil/water or water/oil emulsion, and various types of wetting agents. The compositions also can include stabilizers and preservatives. For examples of carriers, stabilizers and adjuvants, see Martin, REMINGTON'S PHARM. SCI., 15th Ed. (Mack Publ. Co., Easton (1975)).

An "effective amount" is an amount sufficient to effect beneficial or desired results. An effective amount can be administered in one or more administrations, applications or dosages.

A "subject," "individual" or "patient" is used interchangeably herein, which refers to a vertebrate, preferably a mammal, more preferably a human. Mammals include, but are not limited to, murines, simians, humans, farm animals, sport animals, and pets.

A "control" is an alternative subject or sample used in an experiment for comparison purpose. A control can be "positive" or "negative". For example, where the purpose of the experiment is to determine a correlation of an altered expression level of a gene with a particular type of cancer, it is generally preferable to use a positive control (a subject or a sample from a subject, carrying such alteration and exhibiting syndromes characteristic of that disease), and a negative control (a subject or a sample from a subject lacking the altered expression and clinical syndrome of that disease).

A "gene delivery vehicle" is defined as any molecule that can carry inserted polynucleotides into a host cell. Examples of gene delivery vehicles are liposomes, viruses, such as baculovirus, adenovirus and retrovirus, bacteriophage, cosmid, plasmid, fungal vectors and other recombination vehicles typically used in the art which have been described for expression in a variety of eukaryotic and prokaryotic hosts, and may be used for gene therapy as well as for simple protein expression.

A "viral vector" is defined as a recombinantly produced virus or viral particle that comprises a polynucleotide to be delivered into a host cell, either *in vivo*, *ex vivo* or *in vitro*. Examples of viral vectors include retroviral vectors, adenovirus vectors, adeno-associated virus vectors and the like. In aspects where gene transfer is mediated by a retroviral vector, a vector

construct refers to the polynucleotide comprising the retroviral genome or part thereof, and a therapeutic gene. As used herein, "retroviral mediated gene transfer" or "retroviral transduction" carries the same meaning and refers to the process by which a gene or nucleic acid sequences are stably transferred into the host cell by virtue of the virus entering the cell and integrating its genome into the host cell genome. The virus can enter the host cell via its normal mechanism of infection or be modified such that it binds to a different host cell surface receptor or ligand to enter the cell. As used herein, retroviral vector refers to a viral particle capable of introducing exogenous nucleic acid into a cell through a viral or viral-like entry mechanism.

Retroviruses carry their genetic information in the form of RNA; however, once the virus infects a cell, the RNA is reverse-transcribed into the DNA form which integrates into the genomic DNA of the infected cell. The integrated DNA form is called a provirus.

In aspects where gene transfer is mediated by a DNA viral vector, such as an adenovirus (Ad) or adeno-associated virus (AAV), a vector construct refers to the polynucleotide comprising the viral genome or part thereof, and a therapeutic gene. Adenoviruses (Ads) are a relatively well characterized, homogenous group of viruses, including over 50 serotypes (see, *e.g.*, WO 95/27071). Ads are easy to grow and do not require integration into the host cell genome. Recombinant Ad-derived vectors, particularly those that reduce the potential for recombination and generation of wild-type virus, have also been constructed (see, WO 95/00655; WO 95/11984). Wild-type AAV has high infectivity and specificity integrating into the host cells genome. (Hermonat and Muzyczka (1984) *PNAS USA* **81**:6466-6470; Lebkowski et al. (1988) *Mol. Cell. Biol.* **8**:3988-3996).

Vectors that contain both a promoter and a cloning site into which a polynucleotide can be operatively linked are well known in the art. Such vectors are capable of transcribing RNA *in vitro* or *in vivo*, and are commercially available from sources such as Stratagene (La Jolla, CA) and Promega Biotech (Madison, WI). In order to optimize expression and/or *in vitro* transcription, it may be necessary to remove, add or alter 5' and/or 3'

untranslated portions of the clones to eliminate extra, potential inappropriate alternative translation initiation codons or other sequences that may interfere with or reduce expression, either at the level of transcription or translation. Alternatively, consensus ribosome binding sites can be inserted immediately 5' of the start codon to enhance expression.

Gene delivery vehicles also include several non-viral vectors, including DNA/liposome complexes, and targeted viral protein DNA complexes. Liposomes that also comprise a targeting antibody or fragment thereof can be used in the methods of this invention. To enhance delivery to a cell, the nucleic acid or proteins of this invention can be conjugated to antibodies or binding fragments thereof which bind cell surface antigens, e.g., TCR, CD3 or CD4.

"Host cell" is intended to include any individual cell or cell culture which can be or have been recipients for vectors or the incorporation of exogenous polynucleotides, polypeptides and/or proteins. It also is intended to include progeny of a single cell, and the progeny may not necessarily be completely identical (in morphology or in genomic or total DNA complement) to the original parent cell due to natural, accidental, or deliberate mutation. The cells may be procaryotic or eucaryotic, and include but are not limited to bacterial cells, yeast cells, plant cells, insect cells, animal cells, and mammalian cells, e.g., murine, rat, simian or human.

An "antibody" is an immunoglobulin molecule capable of binding an antigen. As used herein, the term encompasses not only intact immunoglobulin molecules, but also anti-idiotypic antibodies, mutants, fragments, fusion proteins, humanized proteins and modifications of the immunoglobulin molecule that comprise an antigen recognition site of the required specificity. The specificity of an antibody refers to the ability of the antibody to distinguish polypeptides comprising the immunizing epitope from other polypeptides.

As used herein, "solid phase support" is not limited to a specific type of support. Rather a large number of supports are available and are known to one of ordinary skill in the art. Solid phase supports include silica gels, resins,

derivatized plastic films, glass beads, cotton, plastic beads. alumina gels. A suitable solid phase support may be selected on the basis of desired end use and suitability for various synthetic protocols. For example, for peptide synthesis, solid phase support may refer to resins such as polystyrene (*e.g.*, PAM-resin obtained from Bachem Inc., Peninsula Laboratories, etc.), POLYHIPE® resin (obtained from Aminotech, Canada), polyamide resin (obtained from Peninsula Laboratories), polystyrene resin grafted with polyethylene glycol (TentaGel®, Rapp Polymere, Tubingen, Germany) or polydimethylacrylamide resin (obtained from Milligen/Biosearch, California). In a preferred embodiment for peptide synthesis, solid phase support refers to polydimethylacrylamide resin.

The phenotype of a cell is determined by the genes expressed within it. The total of expressed genes can be identified by the "transcripts" (transcribed genes represented by the mRNA population) present in the cell. The totality of transcripts present in any particular cell, affected by certain environmental factors or stimuli, and with varying levels of expression of various transcripts in the cell, can be represented by a "transcriptome". The transcriptome is one means by which to identify the cell.

Serial Analysis of Gene Expression or "SAGE" (Velculescu, et al. (1995) *Science* **270**:484-487 and U.S. Patent No. 5,695,937), provides the tool by which the expressed genes and the expression level of the genes of a cell at any one point in the cell cycle and under various environmental stimuli are isolated, sequenced and cataloged. SAGE provides quantitative gene expression data without the prerequisite of a hybridization probe for each transcript. SAGE is based on two principles. First, a short sequence tag (9-11 base pairs) contains sufficient information to uniquely identify a transcript, provided that it is derived from a defined location within that transcript. Second, many transcript tags can be concatenated into a single molecule and then sequenced, revealing the identity of multiple tags simultaneously. The expression pattern of any population of transcripts can be quantitatively evaluated by determining the abundance of individual tags and

identifying the gene corresponding to each tag. Velculescu et al. (1995) *supra* at 484.

Primary and metastatic breast tumor tissue from the same individual has been subjected to SAGE and the tags isolated from each population were compared and analyzed. Therapeutic relevant tags have been isolated. The polynucleotides comprising or corresponding to these tags, as well as polypeptides and antibodies thereto, are aspects of the present invention.

Polynucleotides, Vectors and Host Cells of the Invention

The present invention provides a polynucleotide and populations of polynucleotides that are differentially expressed in a non-metastatic breast tumor as compared to a metastatic breast tumor, or vice versa. The populations of polynucleotides are characterized in whole or in part by the tags represented in Tables 1 and 2, below, or their respective complements. A polynucleotide is determined to be differentially expressed in a non-metastatic breast tumor cell if it is "overexpressed" or "underexpressed" at least 3 fold higher or less the same or corresponding polynucleotide in the metastatic counterpart. In one embodiment, the population of polynucleotides contains tags corresponding to transcripts that are overexpressed in cells derived from a primary breast tumor. In another embodiment, the population of polynucleotides contains tags or transcripts that are overexpressed in cells derived from a metastatic breast tumor. In further embodiments, the transcript or gene has been previously characterized, but was heretofore unknown to be differentially expressed in a metastatic or a non-metastatic breast tumor tissue. These genes or transcripts can be identified, in whole or in part, by specifically hybridizing under moderate or stringent conditions to the polynucleotides comprising or corresponding to polynucleotides identified in Tables 1 and 2, or their respective complements, using the methods described below.

This invention also provides several embodiments comprising different populations identified by the Sequence ID Nos. as follows: 1, 1-5, 1-17, 18-24, Nos. 1-24, 25-36, 1-36, 18-36, 37-53, 54-74, 37-74, 1-53, 1-74, 75-116, 1-116, 117-279, 1-279, 280-549, 1-549, 550-1160, 1-1160, 1161-3175, 1-3175,

3176-3183, 3184-3197, 3176-3197, 3198-3204, 3176-3204, 3205-3213, 3176-3213, 3214-3226, 3176-3226, 3227-3242, 3176-3242, 3243-3294-3176-3294, 3295-3381, 3176-3381, 3382-3554, 3176-3354, 3555-4012, 3176-4012, 4013-5911-3176-5911, 1-5911, or any combination thereof.

In a separate embodiment, the genes or transcripts are identified using sequence homology or allignment software and sequence databases, as described below.

Hybridization can be performed under conditions of different "stringency". Conditions that vary levels of stringency are well known in the art. See, for example, Sambrook, et al. *supra*. Briefly, relevant conditions include temperature, ionic strength, time of incubation, the presence of additional solutes in the reaction mixture such as formamide, and the washing procedure. Higher stringency conditions are those conditions, such as higher temperature and lower sodium ion concentration, which require higher minimum complementarity between hybridizing elements for a stable hybridization complex to form. In general, a moderate stringency hybridization is typically performed at about 50 ^{0}C in 6 X SSC, and a high stringency hybridization reaction is generally performed at about 60 ^{0}C in 1 X SSC.

A number of the polynucleotide sequences disclosed herein are "novel", that is, the tag or its respective complement, lacks substantial sequence homology with any previously identified Expressed Sequence Tags ("EST") or characterized gene sequences. The inventors have searched databases and if no match is found, the "Description" column is blank indicating that no tag has been identified. If the tag corresponds to an EST or gene, the accession number and/or description of the gene or its product are provided in the Tables.

Additional sequence homology searches can be made with the aid of computer methods. A variety of software programs are available in the art. Non-limiting examples of these programs are Blast (Blast is available from the worldwide web at http://www.ncbi.nlm.nih.gov/BLAST/), DNA Star, MegAlign, and GeneJocky. Any sequence database that contains DNA or

protein sequences corresponding to a gene or a segment thereof can be used for sequence analysis. Commonly employed databases include but are not limited to GenBank, EMBL, DDBJ, PDB, SWISS-PROT, EST, STS, GSS, and HTGS. Sequence similarity can be discerned by aligning the tag sequence against a DNA sequence database. Alternatively, the tag sequence can be translated into six reading frames; the predicted peptide sequences of all possible reading frames are then compared to individual sequences stored in a protein database. Parameters for determining the extent of homology set forth by one or more of the aforementioned alignment programs are well established in the art. They include but are not limited to p value and percent sequence identity. P value is the probability that the alignment is produced by chance. For a single alignment, the p value can be calculated according to Karlin et al. (1990) *Proc. Natl. Acad. Sci* **87**: 2246. For multiple alignments, the p value can be calculated using a heuristic approach such as the one programmed in Blast. Percent sequence identify is defined by the ratio of the number of nucleotide or amino acid matches between the query sequence and the known sequence when the two are optimally aligned. A tag sequence is considered to lack substantial homology with any known sequences when the regions of alignment of comparable length exhibit less than 30% of sequence identity, more preferably less than 20% identity, even more preferably less than 10% identity.

The polynucleotides embodied in the present invention also include larger fragments or the full length coding sequences that comprise a novel sequence identified in Tables 1 and 2. Based on the novel sequences disclosed herein, fragments or the full length coding sequences of the corresponding novel transcripts or genes can be identified using various cloning methods known to artisans in the art. Five methods are disclosed in the section "Methods of Cloning Novel Transcripts or Genes" which further assist practitioners of ordinary skill to isolate these transcripts, genes or cDNA containing or corresponding to the tag sequences of the invention.

In addition to the sequences shown in Tables 1 and 2, this invention also provides the anti-sense polynucleotide stand, e.g. antisense RNA to these

sequences or their complements. One can synthesize an antisense RNA based on the sequences provided in the Tables using any methods available in the art, such as the methodology described in Vander Krol et al. (1988) *BioTechniques* 6:958.

The invention also encompasses polynucleotides which differ from that of the polynucleotides described above, but encode substantially the same amino acid sequences. These altered, but phenotypically equivalent polynucleotides are referred to as "functionally equivalent nucleic acids." As used herein, "functionally equivalent nucleic acids" encompass nucleic acids characterized by slight and non-consequential sequence variations that will function in substantially the same manner to produce the same protein product(s) as the nucleic acids disclosed herein (e.g. by virtue of the degeneracy of the genetic codes), or that have conservative amino acid variations. For example, conservative variations include substitution of a non-polar residue with another non-polar residue, or substitution of a charged residue with a similarly charged residue. These sequence variations include those recognized by artisans in the art as those that do not substantially alter the tertiary structure of the encoded protein.

The polynucleotides of the invention can comprise and can be used to identify additional sequences, such as additional encoding sequences within the same transcription unit, controlling elements such as promoters, ribosome binding sites, and polyadenylation sites, additional transcription units under control of the same or a different promoter, sequences that permit cloning, expression, and transformation of a host cell, and any such construct as may be desirable to provide embodiments of this invention.

This invention also provides a promoter sequence derived from cell's genome, wherein the promoter sequence corresponds to the regulatory region of a gene that is differentially expressed in the cell as compared to a control cell. The promoters are identified and characterized by: 1) probing a cDNA library with a probe corresponding to the SAGE tag sequence or generating a portion of the desired cDNA by conducting anchored PCR using primers based on the SAGE tag sequence. Examples of cell types wherein differential

expression of a gene is related to promoter function include using the partial cDNA product obtained in step one above as a probe, cloning the extreme 5' end of the cDNA, and also by using the 5' end of the cDNA as a probe, cloning from a genomic library the promoter of the gene that encodes the cDNA. These promoters are identified using the methods described below in combination with standard molecular techniques. Functionally equivalent sequences, as defined above, are further provided by this invention.

In one aspect, the promoter is a sequence derived from the genome of a metastatic cell's genome, wherein the promoter region corresponds to the regulatory region of a gene that is differentially expressed in the cell as compared to the non-metastatic cell. Alternatively, the promoter is a sequence derived from the genome of a non-metastatic cell's genome, wherein the promoter region corresponds to the regulatory region of a gene that is differentially expressed in the cell as compared to the metastatic cell. Table 1 and 2, below are examples of such a sort.

The promoters identified above can be operatively linked to a foreign polynucleotide to compel differential expression of the foreign polynucleotide. A foreign polynucleotide is intended to include any sequence which encodes in whole or in part a polypeptide or protein. It also includes sequences encoding ribozymes and antisense molecules.

Foreign polynucleotides also include therapeutic genes that encode dominant inhibitory oligonucleotides and peptides as well as genes that encode regulatory proteins and oligonucleotides. Generally, gene therapy will involve the transfer of a single therapeutic gene although more than one gene may be necessary for the treatment of particular diseases. In one embodiment, the therapeutic gene is a dominant inhibiting mutant of the wild-type immunosuppressive agent. Alternatively, the therapeutic gene could be a wild-type copy of a defective gene or a functional homolog.

In one aspect, a tag identified by any of Seq. ID Nos. 1 through 5911 corresponds to or comprises a polynucleotide that encodes a polypeptide or protein that is biologically active as an antigen, e.g., a native antigen, an altered antigen, a self-antigen or a tumor-associated antigen. Antigens are

identified by noting the overexpression or cell-specific expression of a tag identified herein. Using the methods described below, the gene comprising or corresponding to the tag is identified, cloned and inserted into an APC. The tag corresponds to an antigen if a CTL response is raised under appropriate experimental conditions. The peptide is confirmed immunogeneic if an appropriate immune response is elecited.

The invention also encompasses co-administration of an immunostimulatory factor and a foreign polynucleotide, both under the control of promoters. In one embodiment, the promoter is an APC specific promoter. In alternative embodiment, the promoters are specific to tissue identified in Tables 1 and 2. The immunostimulatory factors of this invention include any polypeptide factors that modulate immune responses mediated by APC and corresponding T cells. For example, co-stimulatory factors that are differentially expressed in APCs can be used directly to boost the APC functions *in vivo*. Co-stimulatory factors have been described above.

The polynucleotides of the invention can be introduced and expressed in a suitable host cell for generating a cell-based vaccine. These methods are described in more detail below.

The polynucleotides can be conjugated to a detectable marker, e.g., an enzymatic label or a radioisotope for detection of nucleic acid and/or expression of the gene in a cell. A wide variety of appropriate detectable markers are known in the art, including fluorescent, radioactive, enzymatic or other ligands, such as avidin/biotin, which are capable of giving a detectable signal. In preferred embodiments, one will likely desire to employ a fluorescent label or an enzyme tag, such as urease, alkaline phosphatase or peroxidase, instead of radioactive or other environmental undesirable reagents. In the case of enzyme tags, colorimetric indicator substrates are known which can be employed to provide a means visible to the human eye or spectrophotometrically, to identify specific hybridization with complementary nucleic acid-containing samples.

The polynucleotides embodied in this invention can be obtained using chemical synthesis, recombinant cloning methods, PCR, or any combination

thereof. Methods of chemical polynucleotide synthesis are well known in the art and need not be described in detail herein. One of skill in the art can use the sequence data provided herein to obtain a desired polynucleotide by employing a DNA synthesizer or ordering from a commercial service.

Polynucleotides comprising a desired sequence can be inserted into a suitable vector, and the vector in turn can be introduced into a suitable host cell for replication and amplification. Polynucleotides can be introduced into host cells by any means known in the art. Cells are transformed by introducing an exogenous polynucleotide by direct uptake, endocytosis, transfection, f-mating or electroporation. Once introduced, the exogenous polynucleotide can be maintained within the cell as a non-integrated vector (such as a plasmid) or integrated into the host cell genome. Amplified DNA can be isolated from the host cell by standard methods. See, e.g., Sambrook, et al. (1989) *supra*. RNA can also be obtained from transformed host cell, or it can be obtained directly from the DNA by using a DNA-dependent RNA polymerase.

The present invention further encompasses a variety of gene delivery vehicles comprising the polynucleotide of the present invention. Gene delivery vehicles include both viral and non-viral vectors such as naked plasmid DNA or DNA/liposome complexes. Vectors are generally categorized into cloning and expression vectors. Cloning vectors are useful for obtaining replicate copies of the polynucleotides they contain, or as a means of storing the polynucleotides in a depository for future recovery. Expression vectors (and host cells containing these expression vectors) can be used to obtain polypeptides produced from the polynucleotides they contain. Suitable cloning and expression vectors include any known in the art, e.g., those for use in bacterial, mammalian, yeast and insect expression systems. The polypeptides produced in the various expression systems are also within the scope of the invention and are described above.

When the vectors are used for gene therapy *in vivo* or *ex vivo*, a pharmaceutically acceptable vector is preferred, such as a replication-incompetent retroviral or adenoviral vector. Pharmaceutically acceptable vectors containing the nucleic acids of this invention can be further modified

for transient or stable expression of the inserted polynucleotide. As used herein, the term "pharmaceutically acceptable vector" includes, but is not limited to, a vector or delivery vehicle having the ability to selectively target and introduce the nucleic acid into dividing cells. An example of such a vector is a "replication-incompetent" vector defined by its inability to produce viral proteins, precluding spread of the vector in the infected host cell. An example of a replication-incompetent retroviral vector is LNL6 (Miller A.D. et al. (1989) *BioTechniques* 7:980-990). The methodology of using replication-incompetent retroviruses for retroviral-mediated gene transfer of gene markers is well established (Correll et al. (1989) *PNAS USA* **86**:8912; Bordignon (1989) *PNAS USA* **86**:8912-52; Culver K. (1991) *PNAS USA* **88**:3155; and Rill, D.R. (1991) *Blood* **79(10)**:2694. Clinical investigations have shown that there are few or no adverse effects associated with the viral vectors, see Anderson (1992) *Science* **256**:808-13.

Compositions containing the polynucleotides of this invention, in isolated form or contained within a vector or host cell are further provided herein. When these compositions are to be used pharmaceutically, they are combined with a pharmaceutically acceptable carrier.

A vector of this invention can contain one or more polynucleotides comprising a sequence selected from SEQ ID NOS. 1 to 5911. It can also contain polynucleotide sequences encoding other polypeptides that enhance, facilitate, or modulate the desired result, such as fusion components that facilitate protein purification, and sequences that increase immunogenicity of the resultant protein or polypeptide.

Also embodied in the present invention are host cells transformed with the vectors as described above. Both prokaryotic and eukaryotic host cells may be used. Prokaryotic hosts include bacterial cells, for example *E. coli* and *Mycobacteria*. Among eukaryotic hosts are yeast, insect, avian, plant and mammalian cells. Host systems are known in the art and need not be described in detail herein. Examples of mammalian host cells include but not limited to COS, HeLa, and CHO cells.

The host cells of this invention can be used, inter alia, as repositories of polynucleotides differentially expressed in non-metastatic or metastatic breast tumor cells, or as vehicles for production of the polynucleotides and the encoded polypeptides.

Methods of Cloning Novel Transcripts and Genes

As noted above, this invention encompasses genes, either genomic or cDNA, which code for a polypeptide or protein in the cell of interest. The genes specifically hybridize under moderate or stringent conditions to a polynucleotide identified by SEQ ID NOS. 1 through 5911 or their respective complements. The process of identification of larger fragment or the full-length coding sequence to which the partial sequence depicted in SEQ ID NOS. 1 through 5911 hybridizes preferably involves the use of the methods and reagents provided in this invention, either singularly or in combination. The complete coding sequence for the gene (either genomic or cDNA) may be known or novel.

RACE-PCR Technique

One method to isolate the gene or cDNA which codes for a polypeptide or protein involves the 5'-RACE-PCR technique. In this technique, the poly-A mRNA that contains the coding sequence of particular interest is first identified by hybridization to a sequence disclosed herein and then reverse transcribed with a 3'-primer comprising the sequence disclosed herein. The newly synthesized cDNA strand is then tagged with an anchor primer of a known sequence, which preferably contains a convenient cloning restriction site attached at the 5'end. The tagged cDNA is then amplified with the 3'-primer (or a nested primer sharing sequence homology to the internal sequences of the coding region) and the 5'-anchor primer. The amplification may be conducted under conditions of various levels of stringency to optimize the amplification specificity. 5'-RACE-PCR can be readily performed using commercial kits (available from, e.g., BRL Life Technologies Inc, Clontech) according to the manufacturer's instructions.

Isolation of partial cDNA (3' fragment) by 3' directed PCR reaction

This procedure is a modification of the protocol described in Polyak et al. (1997) *Nature* **389**:300. Briefly, the procedure uses SAGE tags in PCR reaction such that the resultant PCR product contains the SAGE tag of interest as well as additional cDNA, the length of which is defined by the position of the tag with respect to the 3' end of the cDNA. The cDNA product derived from such a transcript driven PCR reaction can be used for many applications.

RNA from a source believed to express the cDNA corresponding to a given tag is first converted to double-stranded cDNA using any standard cDNA protocol. Similar conditions used to generate cDNA for SAGE library construction can be employed except that a modified oligo-dT primer is used to derive the first strand synthesis. For example, the oligonucleotide of composition 5'-**Biotin**-TCC GGC GCG CCG TTT T CC CAG TCA CGA(30)-3', contains a poly-T stretch at the 3' end for hybridization and priming from poly-A tails, an M13 priming site for use in subsequent PCR steps, a 5' Biotin label (**B**) for capture to strepavidin-coated magnetic beads, and an AscI restriction endonuclease site for releasing the cDNA from the streptavidin-coated magnetic beads. Theoretically, any sufficiently-sized DNA region capable of hybridizing to a PCR primer can be used as well as any other 8 base pair recognizing endonuclease.

cDNA constructed utilizing this or similar modified oligo-dT primer is then processed exactly as described in U.S. Patent No. 5,695,937 up until adapter ligation where only one adapter is ligated to the cDNA pool. After adapter ligation, the cDNA is released from the streptavidin-coated magnetic beads and is then used as a template for cDNA amplification.

Various PCR protocols can be employed using PCR priming sites within the 3' modified oligo-dT primer and the SAGE tag. The SAGE tag-derived PCR primer employed can be of varying length dictated by 5' extension of the tag into the adaptor sequence. cDNA products are now available for a variety of applications.

This technique can be further modified by: (1) altering the length and/or content of the modified oligo-dT primer; (2) ligating adaptors other than that previously employed within the SAGE protocol; (3) performing PCR from template retained on the streptavidin-coated magnetic beads; and (4) priming first strand cDNA synthesis with non-oligo-dT based primers.

Isolation of cDNA using GeneTrapper or modified GeneTrapper Technology

The reagents and manufacturer's instructions for this technology are commercially available from Life Technologies, Inc., Gaithersburg, Maryland. Briefly, a complex population of single-stranded phagemid DNA containing directional cDNA inserts is enriched for the target sequence by hybridization in solution to a biotinylated oligonucleotide probe complementary to the target sequence. The target sequence is based on the tag sequence of the present invention. The hybrids are captured on streptavidin-coated paramagnetic beads. A magnet retrieves the paramagnetic beads from the solution, leaving nonhybridized single-stranded DNAs behind. Subsequently, the captured single-stranded DNA target is released from the biotinylated oligonucleotide. After release, the cDNA clone is further enriched by using a nonbiotinylated target oligonucleotide to specifically prime conversion of the single-stranded target to double-stranded DNA. Following transformation and plating, typically 20% to 100% of the colonies represent the cDNA clone of interest. To identify the desired cDNA clone, the colonies may be screened by colony hybridization using the ^{32}P-labeled oligonucleotide as described above for solution hybridization, or alternatively by DNA sequencing and alignment of all sequences obtained from numerous clones to determine a consensus sequence.

Isolation of cDNAs from a library by probing with the SAGE transcript or tag

Classical methods of constructing cDNA libraries are taught in Sambrook et al., *supra*. Recent procedures described in Velculescu et al. (1997) *Science* 270:484) can be employed to construct an expression cDNA library cloned into the ZAP Express vector. A ZAP Express cDNA synthesis kit is available from Stratagene is used accordingly to the manufacturer's

protocol. Plates containing 250 to 2000 plaques are hybridized as described in Rupert et al. (1988) *Mol. Cell. Bio.* 8:3104 to oligonucleotide probes with the same conditions previously described for standard probes except that the hybridization temperature is reduced to room temperature. Washes are performed in 6X standard-saline-citrate 0.1% SDS for 30 minutes at room temperature. The probes are labeled with ^{32}P-ATP through use of T4 polynucleotide kinase.

Identification of known genes or ESTs

In addition, databases exist that reduce the complexity of ESTs by assembling contiguous EST sequences into tentative genes. For example, TIGR has assembled human ESTs into a datable called THC for tentative human consensus sequences. The THC database allows for a more definitive assignment compared to ESTs alone. Software programs exist (TIGR assembler and TIGEM EST assembly machine and contig assembly program (see Huang X. (1996) *Genomics* 33:21-23)) that allow for assembling ESTs into contiguous sequences from any organism.

Polypeptides of the Invention

This invention provides proteins or polypeptides expressed from a polynucleotide of this invention, which is intended to include wild-type and recombinantly produced polypeptides and proteins from procaryotic and eucaryotic host cells, as well as muteins, analogs, fusions and fragments thereof. In some embodiments, the term also includes antibodies and anti-idiotypic antibodies.

It is understood that equivalents or variants of the wild-type polypeptide or protein also are within the scope of this invention. An "equivalent" varies from the wild-type sequence encoded by the polynucleotides of the invention by any combination of additions, deletions, or substitutions while preserving at least one functional property of the fragment relevant to the context in which it is being used. For instance, an equivalent of a polypeptide of the invention may have the ability to elicit an immune

response with a similar antigen specificity as that elicited by the wild-type polypeptide. As is apparent to one skilled in the art, the equivalent may also be associated with, or conjugated with, other substances or agents to facilitate, enhance, or modulate its function.

The invention includes modified polypeptides containing conservative or non-conservative substitutions that do not significantly affect their properties, such as the immunogenicity of the peptides or their tertiary structures. Modification of polypeptides is routine practice in the art. Amino acid residues which can be conservatively substituted for one another include but are not limited to: glycine/alanine; valine/isoleucine/leucine; asparagine/glutamine; aspartic acid/glutamic acid; serine/threonine; lysine/arginine; and phenylalanine/tryosine. These polypeptides also include glycosylated and nonglycosylated polypeptides, as well as polypeptides with other post-translational modifications, such as, for example, glycosylation with different sugars, acetylation, and phosphorylation.

The polypeptides of the invention can also be conjugated to a chemically functional moiety. Typically, the moiety is a label capable of producing a detectable signal. These conjugated polypeptides are useful, for example, in detection systems such as imaging of breast tumor. Such labels are known in the art and include, but are not limited to, radioisotopes, enzymes, fluorescent compounds, chemiluminescent compounds, bioluminescent compounds substrate cofactors and inhibitors. See, for examples of patents teaching the use of such labels, U.S. Patent Nos. 3,817,837; 3,850,752; 3,939,350; 3,996,345; 4,277,437; 4,275,149; and 4,366,241. The moieties can be covalently linked to the polypeptides, recombinantly linked, or conjugated to the polypeptides through a secondary reagent, such as a second antibody, protein A, or a biotin-avidin complex.

Other functional moieties include agents that enhance immunological reactivity, agents that facilitate coupling to a solid support, vaccine carriers, bioresponse modifiers, paramagnetic labels and drugs. Agents that enhance immunological reactivity include, but are not limited to, bacterial superantigens. Agents that facilitate coupling to a solid support include, but

are not limited to, biotin or avidin. Immunogen carriers include, but are not limited to, any physiologically acceptable buffers.

The invention also encompasses fusion proteins comprising polypeptides encoded by the polynucleotides disclosed herein and fragments thereof. Such fusion may be between two or more polypeptides of the invention and a related or unrelated polypeptide. Useful fusion partners include sequences that facilitate the intracellular localization of the polypeptide, or enhance immunological reactivity or the coupling of the polypeptide to an immunoassay support or a vaccine carrier. For instance, the polypeptides can be fused with a bioresponse modifier. Examples of bioresponse modifiers include, but are not limited to, fluorescent proteins such as green fluorescent protein (GFP), cytokines or lymphokines such as interleukin-2 (IL-2), interleukin 4 (IL-4), GM-CSF, and K-interferon. Another useful fusion sequence is one that facilitates purification. Examples of such sequences are known in the art and include those encoding epitopes such as Myc, HA (derived from influenza virus hemagglutinin), His-6, or FLAG. Other fusion sequences that facilitate purification are derived from proteins such as glutathione S-transferase (GST), maltose-binding protein (MBP), or the Fc portion of immunoglobulin. For immunological purposes, tandemly repeated polypeptide segments may be used as antigens, thereby producing highly immunogenic proteins.

The proteins of this invention also can be combined with various liquid phase carriers, such as sterile or aqueous solutions, pharmaceutically acceptable carriers, suspensions and emulsions. Examples of non-aqueous solvents include propyl ethylene glycol, polyethylene glycol and vegetable oils. When used to prepare antibodies, the carriers also can include an adjuvant that is useful to non-specifically augment a specific immune response. A skilled artisan can easily determine whether an adjuvant is required and select one. However, for the purpose of illustration only, suitable adjuvants include, but are not limited to Freund's Complete and Incomplete, mineral salts and polynucleotides.

The proteins and polypeptides of this invention are obtainable by a number of processes well known to those of skill in the art, which include purification, chemical synthesis and recombinant methods. Full-length proteins can be purified from a cell derived from non-metastatic or metastatic breast tumor tissue or tissue lysate by methods such as immunoprecipitation with antibody, and standard techniques such as gel filtration, ion-exchange, reversed-phase, and affinity chromatography using a fusion protein as shown herein. For such methodology, see for example Deutscher et al. (1999) GUIDE TO PROTEIN PURIFICATION: METHODS IN ENZYMOLOGY (Vol. 182, Academic Press). Accordingly, this invention also provides the processes for obtaining these proteins and polypeptides as well as the products obtainable and obtained by these processes.

The proteins and polypeptides also can be obtained by chemical synthesis using a commercially available automated peptide synthesizer such as those manufactured by Perkin Elmer/Applied Biosystems, Inc., Model 430A or 431A, Foster City, CA, USA. The synthesized protein or polypeptide can be precipitated and further purified, for example by high performance liquid chromatography (HPLC). Accordingly, this invention also provides a process for chemically synthesizing the proteins of this invention by providing the sequence of the protein and reagents, such as amino acids and enzymes and linking together the amino acids in the proper orientation and linear sequence.

Alternatively, the proteins and polypeptides can be obtained by well-known recombinant methods as described, for example, in Sambrook et al. (1989) *supra*, using the host cell and vector systems described above.

Antibodies

Also provided by this invention is an antibody capable of specifically binding to the proteins or polypeptides as described above. The antibodies of the present invention encompass polyclonal antibodies and monoclonal antibodies. They include but are not limited to mouse, rat, and rabbit or human antibodies. This invention also encompasses functionally equivalent antibodies and fragments thereof. As used herein with respect to the

exemplified antibodies, the phrase "functional equivalent" means a antibody or fragment thereof, or any molecule having the antigen binding site (or epitope) of the antibody that cross-blocks an exemplified antibody when used in an immunoassay such as immunoblotting or immunoprecipitation.

Antibody fragments include the Fab, Fab', $F(ab')_2$, and Fv regions, or derivatives or combinations thereof. Fab, Fab', and $F(ab')_2$ regions of an immunoglobulin may be generated by enzymatic digestion of the monoclonal antibodies using techniques well known to those skilled in the art. Fab fragments may be generated by digesting the monoclonal antibody with papain and contacting the digest with a reducing agent to reductively cleave disulfide bonds. Fab' fragments may be obtained by digesting the antibody with pepsin and reductive cleavage of the fragment so produce with a reducing agent. In the absence of reductive cleavage, enzymatic digestion of the monoclonal with pepsin produces $F(ab')_2$ fragments.

It will further be appreciated that encompassed within the definition of antibody fragment is single chain antibody that can be generated as described in U.S. Pat. No. 4,704,692, as well as chimeric antibodies and humanized antibodies (Oi et al. (1986) *BioTechniques* **4(3)**:214). Chimeric antibodies are those in which the various domains of the antibodies' heavy and light chains are coded for by DNA from more than one species.

As used herein with regard to the monoclonal antibody, the "hybridoma cell line" is intended to include all derivatives, progeny cells of the parent hybridoma that produce the monoclonal antibodies specific for the polypeptides of the present invention, regardless of generation of karyotypic identity.

Laboratory methods for producing polyclonal antibodies and monoclonal antibodies, as well as deducing their corresponding nucleic acid sequences, are known in the art, see Harlow and Lane (1988) *supra* and Sambrook et al. (1989) *supra*. For production of polyclonal antibodies, an appropriate host animal is selected, typically a mouse or rabbit. The substantially purified antigen, whether the whole transmembrane domain, a fragment thereof, or a polypeptide corresponding to a segment of or the entire

specific loop region within the transmembrane domain, coupled or fused to another polypeptide, is presented to the immune system of the host by methods appropriate for the host. The antigen is introduced commonly by injection into the host footpads, via intramuscular, intraperitoneal, or intradermal routes. Peptide fragments suitable for raising antibodies may be prepared by chemical synthesis, and are commonly coupled to a carrier molecule (e.g., keyhole limpet hemocyanin) and injected into a host over a period of time suitable for the production of antibodies. Alternatively, the antigen can be generated recombinantly as a fusion protein. Examples of components for these fusion proteins include, but are not limited to myc, HA, FLAG, His-6, glutathione S-transferease, maltose binding protein or the Fc portion of immunoglobulin.

The monoclonal antibodies of this invention refer to antibody compositions having a homogeneous antibody population. It is not intended to be limited as regards to the source of the antibody or the manner in which it is made. Generally, monoclonal antibodies are biologically produced by introducing protein or a fragment thereof into a suitable host, e.g., a mouse. After the appropriate period of time, the spleens of such animal is excised and individual spleen cells fused, typically, to immortalized myeloma cells under appropriate selection conditions. Thereafter the cells are clonally separated and the supernatants of each clone are tested for their production of an appropriate antibody specific for the desired region of the antigen using methods well known in the art.

The isolation of other hybridomas secreting monoclonal antibodies with the specificity of the monoclonal antibodies of the invention can also be accomplished by one of ordinary skill in the art by producing anti-idiotypic antibodies (Herlyn et al. (1986) *Science* **232**:100). An anti-idiotypic antibody is an antibody which recognizes unique determinants present on the monoclonal antibody produced by the hybridoma of interest.

Idiotypic identity between monoclonal antibodies of two hybridomas demonstrates that the two monoclonal antibodies are the same with respect to their recognition of the same epitopic determinant. Thus, by using antibodies to the epitopic determinants on a monoclonal antibody it is possible to identify

other hybridomas expressing monoclonal antibodies of the same epitopic specificity.

It is also possible to use the anti-idiotype technology to produce monoclonal antibodies which mimic an epitope. For example, an anti-idiotypic monoclonal antibody made to a first monoclonal antibody will have a binding domain in the hypervariable region which is the mirror image of the epitope bound by the first monoclonal antibody. Thus, in this instance, the anti-idiotypic monoclonal antibody could be used for immunization for production of these antibodies.

Other suitable techniques of antibody production include, but are not limited to, *in vitro* exposure of lymphocytes to the antigenic polypeptides or selection of libraries of antibodies in phage or similar vectors. See Huse et al. (1989) *Science* 246:1275-1281. Genetically engineered variants of the antibody can be produced by obtaining a polynucleotide encoding the antibody, and applying the general methods of molecular biology to introduce mutations and translate the variant. The above described antibody "derivatives" are further provided herein.

Sera harvested from the immunized animals provide a source of polyclonal antibodies. Detailed procedures for purifying specific antibody activity from a source material are known within the art. Undesired activity cross-reacting with other antigens, if present, can be removed, for example, by running the preparation over adsorbants made of those antigens attached to a solid phase and eluting or releasing the desired antibodies off the antigens. If desired, the specific antibody activity can be further purified by such techniques as protein A chromatography, ammonium sulfate precipitation, ion exchange chromatography, high-performance liquid chromatography and immunoaffinity chromatography on a column of the immunizing polypeptide coupled to a solid support.

The specificity of an antibody refers to the ability of the antibody to distinguish polypeptides comprising the immunizing epitope from other polypeptides. An ordinary skill in the art can readily determine without undue experimentation whether an antibody shares the same specificity as a antibody

of this invention by determining whether the antibody being tested prevents an antibody of this invention from binding the polypeptide(s) with which the antibody is normally reactive. If the antibody being tested competes with the antibody of the invention as shown by a decrease in binding by the antibody of this invention, then it is likely that the two antibodies bind to the same or a closely related epitope. Alternatively, one can pre-incubate the antibody of this invention with the polypeptide(s) with which it is normally reactive, and determine if the antibody being tested is inhibited in its ability to bind the antigen. If the antibody being tested is inhibited, then, in all likelihood, it has the same, or a closely related, epitopic specificity as the antibody of this invention.

The antibodies of the invention can be bound to many different carriers. Thus, this invention also provides compositions containing antibodies and a carrier. Carriers can be active and/or inert. Examples of well-known carriers include polypropylene, polystyrene, polyethylene, dextran, nylon, amylases, glass, natural and modified celluloses, polyacrylamides, agaroses and magnetite. The nature of the carrier can be either soluble or insoluble for purposes of the invention. Those skilled in the art will know of other suitable carriers for binding antibodies, or will be able to ascertain such, using routine experimentation.

The antibodies of this invention can also be conjugated to a detectable agent or a hapten. The complex is useful to detect the polypeptide(s) (or polypeptide fragments) to which the antibody specifically binds in a sample, using standard immunochemical techniques such as immunohistochemistry as described by Harlow and Lane (1988). *supra*. There are many different labels and methods of labeling known to those of ordinary skill in the art. Examples of the types of labels which can be used in the present invention include radioisotopes, enzymes, colloidal metals, fluorescent compounds, bioluminescent compounds, and chemiluminescent compounds. Those of ordinary skill in the art will know of other suitable labels for binding to the antibody, or will be able to ascertain such, using routine experimentation.

Furthermore, the binding of these labels to the antibody of the invention can be done using standard techniques common to those of ordinary skill in the art.

Another technique which may also result in greater sensitivity consists of coupling the antibodies to low molecular weight haptens. These haptens can then be specifically detected by means of a second reaction. For example, it is common to use such haptens as biotin, which reacts avidin, or dinitropherryl, pyridoxal, and fluorescein, which can react with specific anti-hapten antibodies. See Harlow and Lane (1988) *supra*.

Compositions containing the antibodies, fragments thereof or cell lines which produce the antibodies, are encompassed by this invention. When these compositions are to be used pharmaceutically, they are combined with a pharmaceutically acceptable carrier.

Uses of polynucleotides, polypeptides and antibodies of the present invention

The polynucleotides, polypeptides and antibodies embodied in this invention provide specific reagents that can be used in standard diagnostic procedures. Accordingly, one embodiment of the present invention is a method of diagnosing the metastatic condition of a breast cell by detecting differential expression of a polynucleotide comprising any one of the sequences listed in SEQ ID NOS. 1 to 5911, or 1-3175 or 3176-5911, or the populations identified above, or the encoded polypeptide(s). The method can be used for aiding in the diagnosis of metastatic breast cancer by detecting a genotype that is correlated with a phenotype characteristic of metastatic breast tumor cells.

In one aspect, overexpression of a polynucleotide identified in Table 2 or comprising or corresponding to Seq. ID No. 3176-5911 is indicative of the non-metastatic state of a breast cell. Conversely, overexpression of a polynucleotide comprising the sequence selected from polynucleotide (e.g., identified in Table 1 or comprising or corresponding to Seq. ID No. 1 to 3175) is indicative of the non-metastatic state of a breast cell.

In yet another aspect, the differential expression of the polynucleotides is determined by assaying for a difference, between the non-metastatic and metastatic breast tumor cells, in the level of transcripts that specifically hybridize with one or more of the exemplified sequences. In another aspect, the differential expression of the polynucleotides is determined by detecting a difference in the level of the encoded polypeptides.

Cell or tissue samples used for this invention encompass body fluid, solid tissue samples, tissue cultures or cells derived therefrom and the progeny thereof, and sections or smears prepared from any of these sources, or any other samples that may contain a breast cell having the polynucleotides disclosed herein or their gene products.

In assaying for an alteration in mRNA level, nucleic acid contained in the aforementioned samples is first extracted according to standard methods in the art. For instance, mRNA can be isolated using various lytic enzymes or chemical solutions according to the procedures set forth in Sambrook et al. (1989), *supra* or extracted by nucleic-acid-binding resins following the accompanying instructions provided by manufactures. The mRNA contained in the extracted nucleic acid sample is then detected by hybridization (e.g. Northern blot analysis) and/or amplification procedures according to methods widely known in the art or based on the methods exemplified herein.

Nucleic acid molecules having at least 10 nucleotides and exhibiting sequence complementarity or homology to the polynucleotides described herein find utility as hybridization probes. It is known in the art that a "perfectly matched" probe is not needed for a specific hybridization. Minor changes in probe sequence achieved by substitution, deletion or insertion of a small number of bases do not affect the hybridization specificity. In general, as much as 20% base-pair mismatch (when optimally aligned) can be tolerated. Preferably, a probe useful for detecting the aforementioned mRNA that is differentially expressed in non-metastatic or metastatic breast tissues is at least about 80% identical to the homologous region of comparable size contained in the sequences to be detected. More preferably, the probe is 85% identical to the corresponding gene sequence after alignment of the homologous region;

even more preferably, it exhibits 90% identity. Specifically, a preferred probe is selected from the group of SEQ ID NOS. 1 to 5911, or their respective complements.

These probes can be used in hybridization reaction (*e.g.* Southern and Northern blot analysis) to detect, prognose, diagnose or monitor the metastatic states associated with the differential expression of these genes. The total size of fragment, as well as the size of the complementary stretches, will depend on the intended use or application of the particular nucleic acid segment. Smaller fragments derived from the known sequences will generally find use in hybridization embodiments, wherein the length of the complementary region may be varied, such as between about 10 and about 100 nucleotides, or even full length according to the complementary sequences one wishes to detect.

Nucleotide probes having complementary sequences over stretches greater than 10 nucleotides in length are generally preferred, so as to increase stability and selectivity of the hybrid, and thereby improving the specificity of particular hybrid molecules obtained. More preferably, one can design nucleic acid molecules having gene-complementary stretches of more than 50 nucleotides in length, or even longer where desired. Such fragments may be readily prepared by, for example, directly synthesizing the fragment by chemical means, by application of nucleic acid reproduction technology, such as the PCR™ technology with two priming oligonucleotides as described in U.S. Pat. No. 4,603,102 or by introducing selected sequences into recombinant vectors for recombinant production. A preferred probe is about 50-75 or more preferably, 50-100, nucleotides in length.

In certain embodiments, it will be advantageous to employ nucleic acid sequences of the present invention in combination with an appropriate means, such as a label, for detecting hybridization and therefore complementary sequences. A wide variety of appropriate indicator means are known in the art, including fluorescent, radioactive, enzymatic or other ligands, such as avidin/biotin, which are capable of giving a detectable signal. In preferred embodiments, one will likely desire to employ a fluorescent label or an enzyme tag, such as urease, alkaline phosphatase or peroxidase, instead of

radioactive or other environmental undesirable reagents. In the case of enzyme tags, colorimetric indicator substrates are known which can be employed to provide a means visible to the human eye or spectrophotometrically, to identify specific hybridization with complementary nucleic acid-containing samples.

The nucleotide probes of the present invention can also be used as primers and detection of genes or gene transcripts that are differentially expressed in certain body tissues. A preferred primer is one comprising a sequence of SEQ ID NOS. 1 through 5911 or their respective complements. Additionally, a primer useful for detecting the aforementioned gene or transcript is at least about 80% identical to the homologous region of comparable size of the gene or transcript to be detected contained in the previously identified sequences. For the purpose of this invention, amplification means any method employing a primer-dependent polymerase capable of replicating a target sequence with reasonable fidelity. Amplification may be carried out by natural or recombinant DNA-polymerases such as T7 DNA polymerase, Klenow fragment of *E.coli* DNA polymerase, and reverse transcriptase.

A preferred amplification method is PCR. General procedures for PCR are taught in MacPherson et al., PCR: A PRACTICAL APPROACH, (IRL Press at Oxford University Press (1991)). However, PCR conditions used for each application reaction are empirically determined. A number of parameters influence the success of a reaction. Among them are annealing temperature and time, extension time, Mg^{2+} ATP concentration, pH, and the relative concentration of primers, templates, and deoxyribonucleotides.

After amplification, the resulting DNA fragments can be detected by agarose gel electrophoresis followed by visualization with ethidium bromide staining and ultraviolet illumination. A specific amplification of the gene or transcript of interest can be verified by demonstrating that the amplified DNA fragment has the predicted size, exhibits the predicated restriction digestion pattern, and/or hybridizes to the correct cloned DNA sequence.

The probes also can be attached to a solid support for use in high throughput screening assays using methods known in the art. PCT WO 97/10365 and U.S. Patent numbers 5,405,783, 5,412,087 and 5,445,934, for example, disclose the construction of high density oligonucleotide chips which can contain one or more of the sequences disclosed herein. Based in the methods disclosed in U.S. Patent numbers 5,405,783, 5,412,087 and 5,445,934, the probes of this invention are synthesized on a derivatized glass surface. Photoprotected nucleoside phosphoramidites are coupled to the glass surface, selectively deprotected by photolysis through a photolithographic mask, and reacted with a second protected nucleoside phosphoramidite. The coupling/deprotection process is repeated until the desired probe is complete.

The expression level of a gene of interest is determined through exposure of a nucleic acid sample to the probe-modified chip. Extracted nucleic acid is labeled, for example, with a fluorescent tag, preferably during an amplification step. Hybridization of the labeled sample is performed at an appropriate stringency level. The degree of probe-nucleic acid hybridization is quantitatively measured using a detection device, such as a confocal microscope. See U.S. Pat Nos. 5,578,832 and 5,631,734. The obtained measurement is directly correlated with gene expression level.

More specifically, the probes and high density oligonucleotide probe arrays provide an effective means of monitoring expression of a multiplicity of genes. The expression monitoring methods of this invention may be used in a wide variety of circumstances including detection of disease, identification of differential gene expression between two samples, or screening for compositions that upregulate or downregulate the expression of particular genes.

In another preferred embodiment, the methods of this invention are used to monitor expression of the genes which specifically hybridize to the probes of this invention in response to defined stimuli, such as a drug.

In one embodiment, the hybridized nucleic acids are detected by detecting one or more labels attached to the sample nucleic acids. The labels may be incorporated by any of a number of means well known to those of skill

in the art. However, in one aspect, the label is simultaneously incorporated during the amplification step in the preparation of the sample nucleic acid. Thus, for example, polymerase chain reaction (PCR) with labeled primers or labeled nucleotides will provide a labeled amplification product. In a separate embodiment, transcription amplification, as described above, using a labeled nucleotide (e.g. fluorescein-labeled UTP and/or CTP) incorporates a label in to the transcribed nucleic acids.

Alternatively, a label may be added directly to the original nucleic acid sample (e.g., mRNA, polyA, mRNA, cDNA, etc.) or to the amplification product after the amplification is completed. Means of attaching labels to nucleic acids are well known to those of skill in the art and include, for example nick translation or end-labeling (e.g. with a labeled RNA) by kinasing of the nucleic acid and subsequent attachment (ligation) of a nucleic acid linker joining the sample nucleic acid to a label (e.g., a fluorophore).

The nucleic acid sample also may be modified prior to hybridization to the high density probe array in order to reduce sample complexity thereby decreasing background signal and improving sensitivity of the measurement using the methods disclosed in WO 97/10365.

Results from the chip assay are typically analyzed using a computer software program. See, for example, EP 0717 113 A2 and WO 95/20681. The hybridization data are read into the program, which calculates the expression level of the targeted gene(s). This figure is compared against existing data sets of gene expression levels for diseased and healthy individuals. A correlation between the obtained data and that of a set of diseased individuals having non-metastatic or metastatic breast cancer indicates the neoplastic stage of the tested tumor sample.

Expression of the genes associated with breast cancer progression can also be determined by examining the protein product of the polynucleotides of the present invention. Determining the protein level involves a) providing a biological sample containing polypeptides; and (b) measuring the amount of any immunospecific binding that occurs between an antibody reactive to the

protein products of interest and a component in the sample, in which the amount of immunospecific binding indicates the level of the protein products.

A variety of techniques are available in the art for protein analysis. They include but are not limited to radioimmunoassays, ELISA (enzyme linked immunoradiometric assays), "sandwich" immunoassays, immunoradiometric assays, in situ immunoassays (using *e.g.*, colloidal gold, enzyme or radioisotope labels), western blot analysis, immunoprecipitation assays, immunoflourescent assays, and SDS-PAGE. In addition, cell sorting analysis can be employed to detect cell surface antigens. Such analysis involves labeling target cells with antibodies coupled to a detectable agent, and then separating the labeled cells from the unlabeled ones in a cell sorter. A sophisticated cell separation method is fluorescence-activated cell sorting (FACS). Cells traveling in single file in a fine stream are passed through a laser beam, and the fluorescence of each cell bound by the fluorescently labeled antibodies is then measured.

Antibodies that specifically recognize and bind to the protein products of interest are required for conducting the aforementioned protein analyses. These antibodies may be purchased from commercial vendors or generated and screened using methods well known in the art. See Harlow and Lane (1988) *supra.* and Sambrook et al. (1989) *supra.*

In diagnosing malignancy or metastasis characterized by a differential expression of genes or transcripts that are associated with either the non-metastatic or metastatic state of a breast cell, one typically conducts a comparative analysis of the subject and appropriate controls. Preferably, a diagnostic test includes a control sample derived from a subject (hereinafter positive control), that exhibits a detectable increase in expression of the genes, preferably at a level of 3 folds or more and clinical characteristics of tumor metastasis. More preferably, a diagnosis also includes a control sample derived from a subject (hereinafter negative control), that lacks the clinical characteristics of the metastatic state and whose expression level of the gene at question is within a normal range. A positive correlation between the subject and the positive control with respect to the identified differential gene

expression indicates the presence or a predisposition of metastatic breast cancer. A lack of correlation between the subject and the negative control confirms the diagnosis.

The selection of an appropriate control cell or tissue is dependent on the sample cell or tissue initially selected and its phenotype which is under investigation. Whereas the sample cell is derived from a metastatic breast tumor tissue, one or more counterpart non-metastatic cells of the sample cells can be used as control cells. Counterparts would include, for example, cell lines established from the same or related cells to those found in the sample cell population. Preferably, a control matches the tissue, and/or cell type the tested sample is derived from. More preferably, a control is derived from a primary breast tumor of the same individual from whom the test sample is derived. It is also preferable to analyze the control and the tested sample in parallel.

There are various methods available in the art for quantifying mRNA or protein level from a cell sample and indeed, any method that can quantify these levels is encompassed by this invention. For example, determination of the mRNA level of the gene may involve, in one aspect, measuring the amount of mRNA in a mRNA sample isolated from the breast cell by hybridization or quantitative amplification using at least one oligonucleotide probe that is complementary to the mRNA. Determination of the aforementioned protein products requires measuring the amount of immunospecific binding that occurs between an antibody reactive to the product of interest. To detect and quantify the immunospecific binding, or signals generated during hybridization or amplification procedures, digital image analysis systems including but not limited to those that detect radioactivity of the probes or chemiluminescence can be employed.

Screening Assays

The present invention also provides a screen for various agents which modulate the expression of a polynucleotide associated the metastatic condition of a breast cell by first contacting a cell with an effective amount of

a potential agent, and then assaying for a change in the expression level of a polynucleotide selected from the populations identified above. A change in the expression level is indicative of a candidate therapeutic agent. Preferably, the agent when administered into a cell or subject reduces the level of expression of a gene or transcript that is associated with breast cancer progression and is further characterized as comprising a sequence selected from SEQ ID NO. 1 through 3175. A preferred agent may also enhance expression of genes or transcripts comprising a sequence of SEQ ID NOS. 3176 to 5911. In certain aspects of the invention, an agent may result in phenotypic changes of the recipient cell as evidenced by an agent-induced cell apoptosis, a reduced rate of cell growth or cell motility. Altered gene expression can be detected by assaying for altered mRNA expression or protein expression using the probes, primers and antibodies as described herein.

To practice the method *in vitro*, suitable cell cultures or tissue cultures from metastatic breast cells are first provided. The cell can be a cultured cell or a genetically modified cell in which a transcript from SEQ ID NOS. 1 through 5911, or their complements, or alternatively, transcripts which contain or correspond to a tag or its respective complement is expressed. Alternatively, the cells can be from a tissue biopsy. The cells are cultured under conditions (temperature, growth or culture medium and gas (CO_2)) and for an appropriate amount of time to attain exponential proliferation without density dependent constraints. It also is desirable to maintain an additional separate cell culture; one which does not receive the agent being tested as a control.

As is apparent to one of skill in the art, suitable cells may be cultured in microtiter plates and several agents may be assayed at the same time by noting genotypic changes and/or phenotypic changes.

When the agent is a composition other than naked DNA or RNA, the agent may be directly added to the cell culture or added to culture medium for addition. As is apparent to those skilled in the art, an "effective" amount must be added which can be empirically determined. When the agent is a

polynucleotide, it may be introduced directly into a cell by transfection or electroporation. Alternatively, it may be inserted into the cell using a gene delivery vehicle or other methods as described above.

For the purposes of this invention, an "agent" is intended to include, but not be limited to a biological or chemical compound such as a simple or complex organic or inorganic molecule, a peptide, a protein (e.g. antibody) or a polynucleotide (e.g. anti-sense). A vast array of compounds can be synthesized, for example polymers, such as polypeptides and polynucleotides, and synthetic organic compounds based on various core structures, and these are also included in the term "agent". In addition, various natural sources can provide compounds for screening, such as plant or animal extracts, and the like. It should be understood, although not always explicitly stated that the agent is used alone or in combination with another agent, having the same or different biological activity as the agents identified by the inventive screen. The agents and methods also are intended to be combined with other therapies.

The assays also can be performed in a subject. When the subject is an animal such as a rat, mouse or simian, the method provides a convenient animal model system which can be used prior to clinical testing of an agent. In this system, a candidate agent is a potential drug if transcript expression is altered, i.e., upregulated (such as restoring tumor suppressor function), downregulated or eliminated as with drug resistant genes or oncogenes, or if symptoms associated or correlated to the presence of cells containing transcript expression are ameliorated, each as compared to untreated, animal having the pathological cells. It also can be useful to have a separate negative control group of cells or animals which are healthy and not treated, which provides a basis for comparison. After administration of the agent to subject, suitable cells or tissue samples are collected and assayed for altered gene expression.

As an example of an animal model, groups of nude mice (Balb/c NCR nu/nu female, Simonsen, Gilroy, CA) are each subcutaneously inoculated with about 10^5 to about 10^9 hyperproliferative, cancer or target cells as defined herein. When the tumor is established, the agent is administered, for example, by subcutaneous injection around the tumor. Tumor measurements to

determine reduction of tumor size are made in two dimensions using venier calipers twice a week. Other animal models may also be employed as appropriate.

These agents of this invention and the above noted compounds and their derivatives can be combined with a pharmaceutically acceptable carrier for the preparation of medicaments for use in the methods described herein. They can be administered to treat a cancerous condition, or to prevent progression from a pre-neoplastic or non-metastatic state into a neoplastic or a metastatic state.

In a preferred embodiment, an agent of the present invention is administered to reverse the metastatic condition of a breast cell. As used herein, the term "reversing the metastatic condition" of a cell is intended to include apoptosis, necrosis or any other means of preventing cell division, reduced cell motility, loss of pharmaceutical resistance, maturation, differentiation or reversion of any other metastatic phenotypes. For example, characteristics associated with a metastatic phenotype (a set of *in vitro* characteristics associated with a tumorigenic ability *in vivo*) include but are not limited to a more rounded cell morphology, looser substratum attachment, loss of contact inhibition, and loss of anchorage dependence.

One can determine if reversion of the metastatic condition of a breast cell is achieved by performing assays standard in the art. For example, cell proliferation can be assayed by measuring ^{3}H-thymidine incorporation, by direct cell count, by detecting changes in transcriptional activity of known genes such as proto-oncogenes (e.g., fos, myc) or cell cycle markers; cell viability can be assessed by staining cells with a dye that reacts with either living or dead cells; cellular differentiation can be monitored by histological methods or by detecting the presence or loss of certain surface markers that are associated with undifferentiated or differentiated phenotype; cell motility can be assayed directly by measuring the cell migration speed, or indirectly by determining the fraction of cells developed lamellipodia.

The agents of the present invention can be administered to a cell or a subject by various delivery systems known in the art. Non-limiting examples

include encapsulation in liposomes, microparticles, microcapsules, expression by recombinant cells, receptor-mediated endocytosis (see, *e.g.*, Wu and Wu (1987) *J. Biol. Chem.* **262**:4429-4432), and construction of a therapeutic nucleic acid as part of a retroviral or other vector. Methods of delivery include but are not limited to transdermally, gene therapy, intra-arterial, intra-muscular, intravenous, intranasal, and oral routes, and include sustained delivery systems. In a specific embodiment, it may be desirable to administer the pharmaceutical compositions of the invention locally to the area in need of treatment; this may be achieved by, for example, and not by way of limitation, local infusion during surgery, by injection, or by means of a catheter or targeted gene delivery of the sequence coding for the therapeutic.

The agents identified herein as effective for their intended purpose can be administered to subjects or individuals susceptible to or at risk of developing breast cancer. When the agent is administered to a subject such as a mouse, a rat or a human patient, the agent can be added to a pharmaceutically acceptable carrier and systemically or topically administered to the subject. Therapeutic amounts can be empirically determined and will vary with the pathology being treated, the subject being treated and the efficacy and toxicity of the agent.

Administration *in vivo* can be effected in one dose, continuously or intermittently throughout the course of treatment. Methods of determining the most effective means and dosage of administration are well known to those of skill in the art and will vary with the composition used for therapy, the purpose of the therapy, the target cell being treated, and the subject being treated. Single or multiple administrations can be carried out with the dose level and pattern being selected by the treating physician. Suitable dosage formulations and methods of administering the agents can be found below.

The agents and compositions of the present invention can be used in the manufacture of medicaments and for the treatment of humans and other animals by administration in accordance with conventional procedures, such as an active ingredient in pharmaceutical compositions.

The pharmaceutical compositions can be administered orally, intranasally, parenterally, transdermally or by inhalation therapy, and may take the form of tablets, lozenges, granules, capsules, pills, ampoules, suppositories or aerosol form. They may also take the form of gene therapy, suspensions, solutions and emulsions of the active ingredient in aqueous or nonaqueous diluents, syrups, granulates or powders. In addition to an agent of the present invention, the pharmaceutical compositions can also contain other pharmaceutically active compounds or a plurality of compounds of the invention.

It should be understood that in addition to the ingredients particularly mentioned above, the formulations of this invention may include other agents conventional in the art having regard to the type of formulation in question, for example, those suitable for oral administration may include such further agents as sweeteners, thickeners and flavoring agents. It also is intended that the agents, compositions and methods of this invention be combined with other suitable compositions and therapies.

Non-Human Transgenic Animals

In another aspect, the novel polynucleotide sequences associated with non-metastatic and metastatic breast cancer can be used to generate transgenic animal models. In recent years, geneticists have succeeded in creating transgenic animals, for example mice, by manipulating the genes of developing embryos and introducing foreign genes into these embryos. Once these genes have integrated into the genome of the recipient embryo, the resulting embryos or adult animals can be analyzed to determine the function of the gene. The mutant animals are produced to understand the function of known genes *in vivo* and to create animal models of human diseases. (*see, e.g.*, Chisaka *et al.* (1992) **355**:516-520; Joyner et al. (1992) in POSTIMPLANTATION DEVELOPMENT IN THE MOUSE (Chadwick and Marsh, eds., John Wiley & Sons, United Kingdom) pp:277-297; Dorin et al. (1992) Nature **359**:211-215).

Genomics Applications

A cell's transcriptome offers a snapshot of all expressed genes and their relative level of expression. This information provides a library for the study of the number and types of genes whose transcription is induced or regulated during cell processes such as activation, differentiation, aging, viral transformation, morphogenesis, and mitosis. A comparison of the transcriptomes of a particular cell at various times during the life of the cell, under the same or different environmental stimuli, provides insight into the regulatory process of the cell. Using the transcripts provided herein, the analysis of these and other cellular processes and the effects of environmental stimuli on the cell is possible.

This invention also provides a process for preparing a database for the analysis of a cell's expressed genes by storing in a digital storage medium information related to the sequences of the transcriptome. Using this method, a data processing system for standardized representation of the expressed genes of a cell is compiled. The data processing system is useful to analyze gene expression between two cells by first selecting a cell and then identifying and sequencing the transcriptome of the cell. This information is stored in a computer-readable storage medium as the transcriptome. The transcriptome is then compared with at least one sequence(s) of transcription fragments from a reference cell. The compared sequences are then analyzed. Uniquely expressed sequences and sequences differentially expressed between the reference cell and the selected cell can be identified by this method.

In other words, this invention provides a computer based method for screening the homology of an unknown DNA or mRNA sequence against the complete set of expressed genes of a preselected cell by first providing the complete set of expressed genes, i.e., the transcriptome, in computer readable form and homology screening the DNA or mRNA of the unknown sequence against transcriptome and determining whether the DNA sequence of the unknown contains similarities to any portion of the transcriptome listed in the computer readable form.

Thus, the information provided herein also provides a means to compare the relative abundance of gene transcripts in different biological specimens by use of high-throughput sequence-specific analysis of individual RNAs or their corresponding cDNAs using a modification of the systems described in WO 95/2068, 96/23078 and 5,618,672.

The tags or transcripts also can be attached to a solid support for use in high throughput screening assays. PCT WO 97/10365, for example, discloses the construction of high density oligonucleotide chips. See also, U.S. Pat. Nos. 5,405,783, 5,412,087 and 5,445,934. Using this method, the probes are synthesized on a derivatized glass surface. Photoprotected nucleoside phosphoramidites are coupled to the glass surface, selectively deprotected by photolysis through a photolithographic mask, and reacted with a second protected nucleoside phosphoramidite. The coupling/deprotection process is repeated until the desired probe is complete.

The expression level of a gene is determined through exposure of a nucleic acid sample to the probe-modified chip. Extracted nucleic acid is labeled, for example, with a fluorescent tag, preferably during an amplification step. Hybridization of the labeled sample is performed at an appropriate stringency level. The degree of probe-nucleic acid hybridization is quantitatively measured using a detection device, such as a confocal microscope. See U.S. Pat Nos. 5,578,832 and 5,631,734. The obtained measurement is directly correlated with gene expression level.

Results from the chip assay are typically analyzed using a computer software program. See, for example, EP 0717 113 A2 and WO 95/20681. The hybridization data is read into the program, which calculates the expression level of the targeted gene(s). This figure is compared against existing data sets of gene expression levels for that cell type.

For example, the database and methods of using the database provides a means to differentiate normal metastatic from pleural effusion cells from abnormal metastatic from pleural effusion cells. It also allows one to differentiate between metastatic from pleural effusion cells biopsied from different regions from a patient or subject or gene expression before or after

treatment with a potential therapeutic agent. It can be used to analyze drug toxicity and efficacy, as well as to selectively look at protein categories which are expected to be affected by a drug or which may be overexpressed as a result of treatment with a drug, such as the various multi-drug resistant genes. Additional utilities of the database include, but are not limited to analysis of the developmental state of a test cell, the influence of viral or bacterial infection, control of cell cycle, effect of a tumor suppressor gene or lack thereof, polymorphism within the cell type, apoptosis, and the effect of regulatory genes.

Vaccines for Cancer Treatment and Prevention

In one embodiment, the present invention comprises vaccines for cancer treatment. Recent advances in vaccine adjuvants provide effective means of administering peptides so that they impact maximally on the immune system. Del-Giudice (1994) Experientia 50:1061-1066. A polynucleotide encoding the antigenic peptide also can be administerd as a cancer vaccine. The polynucleotide can be administered as naked DNA or alternatively, in expression vectors. Therapy can be enhanced by coadministration of cytokines and/or co-stimulatory molecules which in turn, can be administered as proteins or the polynucleotides encoding the proteins.

Host Cells comprising Antigenic Peptides of the Invention

The invention further provides isolated host cells comprising antigenic peptides of the invention. In some embodiments, these host cells present one or more peptides of the invention on the surface of the cell in the context of an MHC molecule, i.e., a antigenic peptide of the invention is bound to a cell surface MHC molecule such that the peptide can be recognized by an immune effector cell. Isolated host cells which present the polypeptides of this invention in the context of MHC molecules are further useful to expand and isolate a population of educated, antigen-specific immune effector cells. The immune effector cells, e.g., cytotoxic T lymphocytes, are produced by culturing naïve immune effector cells with antigen-presenting cells cells which

present the polypeptides in the context of MHC molecules on the surface of the APCs. The population can be purified using methods known in the art, e.g., FACS analysis or FICOLL™ gradient. The methods to generate and culture the immune effector cells as well as the populations produced thereby also are the inventors' contribution and invention. Pharmaceutical compositions comprising the cells and pharmaceutically acceptable carriers are useful in adoptive immunotherapy. Prior to administration *in vivo,* the immune effector cells are screened *in vitro* for their ability to lyse melanoma tumor cells.

Gene transfer

Vectors useful in genetic modification

In one embodiment, the present invention provides methods of eliciting efficient antigen-specific immune response in a subject by introducing to the subject recombinant polynucleotides encoding antigenic peptides alone or in combination with immunostimulatory factors. Methods and materials for gene transfer are known in the art, including, for example, viral mediated gene transfer, lipofection, transformation, transfection and transduction. The polynucleotides encoding the immunostimulatory factor and target antigenic peptide can be introduced ex vivo into a host cell, for example, dendritic cells. The genetically modified host cells can be introduced as a cell-based vaccine into the target subject. Alternatively, the polynucleotides encoding the immunostimulatory factor and target antigenic peptidecan be introduced directly into the subject in the form of gene-based vaccine.

Various viral infection techniques have been developed which utilize recombinant viral vectors for gene delivery, and constitute preferred approaches to the present invention. The viral vectors which have been used in gene transfer include, but not limited to, viral sequences derived from simian virus 40 (SV40), adenovirus, adeno-associated virus (AAV), and retroviruses.

Vector Transduction of Cells such as APCs

APCs can be transduced with viral vectors encoding a relevant polypeptides. The most common viral vectors include recombinant poxviruses such as vaccinia and fowlpox virus (Bronte et al. (1997) Proc. Natl. Acad. Sci. USA 94:3183-3188; Kim et al. (1997) J. Immunother. **20**:276-286) and, preferentially, adenovirus (Arthur et al. (1997) J. Immunol. **159**:1393-1403; Wan et al. (1997) Human Gene Therapy **8**:1355-1363; Huang et al. (1995) J. Virol. **69**:2257-2263). Retrovirus also may be used for transduction of human APCs (Marin et al. (1996) J. Virol. **70**:2957-2962).

In vitro or *ex vivo* exposure of human DCs to adenovirus (Ad) vector at a multiplicity of infection (MOI) of 500 for 16-24 h in a minimal volume of serum-free medium reliably gives rise to foreign polynucleotide expression in 90-100% of DCs. The efficiency of transduction of DCs or other APCs can be assessed by immunofluorescence using fluorescent antibodies specific for the tumor antigen being expressed (Kim et al. (1997) J. Immunother. **20**:276-286). Alternatively, the antibodies can be conjugated to an enzyme (e.g. HRP) giving rise to a colored product upon reaction with the substrate. The actual amount of antigenic polypeptides being expressed by the APCs can be evaluated by ELISA.

In vivo transduction of DCs, or other APCs, can be accomplished by administration of Ad (or other viral vectors) via different routes including intravenous, intramuscular, intranasal, intraperitoneal or cutaneous delivery. The preferred method is cutaneous delivery of Ad vector at multiple sites using a total dose of approximately $1x10^{10}$-$1x\ 10^{12}$ i.u. Levels of *in vivo* transduction can be roughly assessed by co-staining with antibodies directed against APC marker(s) and the antigen being expressed. The staining procedure can be carried out on biopsy samples from the site of administration or on cells from draining lymph nodes or other organs where APCs (in particular DCs) may have migrated (Condon et al. (1996) Nature Med. **2**:1122-1128; Wan et al. (1997) Human Gene Therapy **8**:1355-1363). The amount of antigen being expressed at the site of injection or in other organs where

transduced APCs may have migrated can be evaluated by ELISA on tissue homogenates.

Although viral gene delivery is more efficient, DCs can also be transduced *in vitro/ex vivo* by non-viral gene delivery methods such as electroporation, calcium phosphate precipitation or cationic lipid/plasmid DNA complexes (Arthur et al. (1997) Cancer Gene Therapy 4:17-25). Transduced APCs can subsequently be administered to the host via an intravenous, subcutaneous, intranasal, intramuscular or intraperitoneal route of delivery.

In vivo transduction of DCs, or other APCs, can potentially be accomplished by administration of cationic lipid/plasmid DNA complexes delivered via the intravenous, intramuscular, intranasal, intraperitoneal or cutaneous route of administration. Gene gun delivery or injection of naked plasmid DNA into the skin also leads to transduction of DCs (Condon et al. (1996) Nature Med. 2:1122-1128 and Raz et al. (1994) Proc. Natl. Acad. Sci. USA 91:9519-9523). Intramuscular delivery of plasmid DNA may also be used for immunization (Rosato et al. (1997) Human Gene Therapy 8:1451-1458.

The transduction efficiency and levels of foreign polynucleotide expression can be assessed as described above for viral vectors.

Administration of Cell-Based Vaccine to Subject

Genetically modified cells can subsequently be administered to the host subject via various routes, including, for example, intravenous infusion, subcutaneous injection, intranasal, intramuscular or intraperitoneal delivery. The cells containing the recombinant polynucleotides may be used to confer immunity to individuals. Administration *in vivo* can be effected in one dose, continuously or intermittently throughout the course of treatment. Methods of determining the most effective means and dosage of administration are well known to those of skill in the art and will vary with the composition used for therapy, the purpose of the therapy, the target cell being treated, and the

subject being treated. Single or multiple administrations can be carried out with the dose level and pattern being selected by the treating physician.

Adoptive Immunotherapy Methods

Expanded populations of antigen-specific immune effector cells and APCs presenting antigens find use in adoptive immunotherapy regimes.

Adoptive immunotherapy methods involve, in one aspect, administering to a subject a substantially pure population of educated, antigen-specific immune effector cells made by culturing naïve immune effector cells with APCs as described above. In some embodiments, the APCs are dendritic cells.

In one embodiment, the adoptive immunotherapy methods described herein are autologous. In this case, the APCs are made using parental cells isolated from a single subject. The expanded population also employs T cells isolated from that subject. Finally, the expanded population of antigen-specific cells is administered to the same patient.

In a further embodiment, APCs or immune effector cells are administered with an effective amount of a stimulatory cytokine, such as IL-2 or a co-stimulatory molecule.

Immune Effector Cells

The present invention makes use of antigen-presenting matrices, including APCs, to stimulate production of an enriched population of antigen-specific immune effector cells. Accordingly, the present invention provides a population of cells enriched in educated, antigen-specific immune effector cells, specific for an antigenic peptide of the invention. These cells can cross-react with (bind specifically to) antigenic determinants (epitopes) on natural (endogenous) antigens. In some embodiments, the natural antigen is on the surface of tumor cells and the educated, antigen-specific immune effector cells of the invention suppress growth of the tumor cells. When APCs are used, the antigen-specific immune effector cells are expanded at the expense of the APCs, which die in the culture. The process by which naïve immune effector

cells become educated by other cells is described essentially in Coulie (1997) Molec. Med. Today 3:261-268.

An effector cell population suitable for use in the methods of the present invention can be autogeneic or allogeneic, preferably autogeneic. When effector cells are allogeneic, preferably the cells are depleted of alloreactive cells before use. This can be accomplished by any known means, including, for example, by mixing the allogeneic effector cells and a recipient cell population and incubating them for a suitable time, then depleting $CD69^+$ cells, or inactivating alloreactive cells, or inducing anergy in the alloreactive cell population.

Hybrid immune effector cells can also be used. Immune effector cell hybrids are known in the art and have been described in various publications. See, for example, International Patent Application Nos. WO 98/46785; and WO 95/16775.

The following examples are intended to illustrate, but not limit, the invention.

Examples

SAGE Analysis

A comparative analysis of transcripts expressed in metastatic and primary breast tissues from the same individual was performed by Serial Analysis of Gene Expression ("SAGE") (U.S. Patent No. 5,695,937). Briefly, the SAGE analysis began with providing complementary deoxyribonucleic acid (cDNA) from (1) the metastatic population and (2) non-metastatic population of cells. cDNAs derived from both cell populations were linked to primer sites. Sequence tags were then created, for example, using the appropriate primers to amplify the DNA. By measuring the differences in these tags between the two cell populations, sequences which are preferentially expressed in one but not the other cell type were identified.

Identifying Genes and ESTs Starting from SAGE tags

The primary sequence data were evaluated from the raw concatamer sequences, to count the occurrence of each tag, and provide a report tabulating each SAGE tag and its expression level. Table 2 summarizes the tags corresponding to distinct genes that are preferentially expressed in the primary breast tumor tissue, and Table 1 summarizes the gene sequences that are preferentially expressed in the metastatic breast tumor tissue. Sequence comparison of the tags identified a highly expressed gene, prohibitin as is an anti-proliferative factor (see a review by McClung et al. (1995) *Exp. Gerontol* **30**: 99) and loss of this activity has been documented to occur during the progression of breast cancer (Sato et al. (1992) *Cancer Research* **52**: 1643).

Of the tags found to be overexpressed in the metastatic breast tissue, many of them were found to match with a known gene sequence. Among them are DNA replication licensing factor that is known to be involved in cell proliferation, and adhesion molecules like p-cadherin that may contribute to the invasiveness of tumor cells. These genes are thus candidate therapeutic targets; down-regulation of their activities may inhibit or prevent cancer metastasis. Many of the tags were not found to match to any known genes or ESTs after searching gene databases. These tags identify novel tags or transcripts or genes and are identified in the column "description" as having "nm" (no match) or having a blank space therein.

While the above description is used to identify human genes, it should be noted that the same procedure has been used for numerous other organisms (rat, mouse, etc), anchoring enzymes, and tag lengths merely by modifying appropriate parameters.

Although the foregoing invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, it will be apparent to those skilled in the art that certain changes and modifications will be practiced. Therefore, the description and examples should not be construed as limiting the scope of the invention, which is delineated by the appended claims.

Table 1

Breast Cancer - Transcripts upregulated in metastatic breast tumor cells

TAG	Description	Accession	SEQ ID NO
GGTATGTTGT			1
ATGCTCCCTG	Human Mac-2 binding protein mRNA, complete cds.	L13210	2
GTCTGGGGGA	Human lysophospholipase homolog (HU-K5) mRNA, comp	U67963	3
GGTTGAAAAA			4
CGGATTATCC	H.sapiens BM28 mRNA.	X67334	5
CTTCCTTGCC	Human radiated keratinocyte mRNA 266 (keratin-rela	X05803	6
GTCATAGCTG	Homo sapiens (DCIS-1) mRNA fragment.	L27636	7
CTTCAAGAGA			8
TGGACCCCCC			9
GTCTGCACCT			10
CTGTGCAGCA	Human spermidine synthase mRNA, complete cds.	M34338	11
TGGATCAACC	H.sapiens mRNA for caveolin.	Z18951	12
CTCCCTCCTC	Human thymidine kinase mRNA, complete cds.	K02581	13
ATCGTGGCGG	Homo sapiens hCPE-R mRNA for CPE-receptor, complet	AB0007	14
AAAGAAAAAA			15
CCTGAAAAGC			16
TGTAGGTCAT			17
CCTGACGCTC			18
TGTTCATCAT			19
TACGGTGGCG	H.sapiens mRNA for p cadherin.	X63629	20
GCAGGAATTG	Human farnesyl pyrophosphate synthetase mRNA (hpt8	M29863	21
ACTTTTTCAA			22
ATCCGTGCCC	Human calmodulin mRNA, complete cds.	J04046	23
TTCTTATTTT	Human spliceosome associated protein (SAP 145) mRN	U41371	24
CAGTCCGCTT			25
GTCACCCCCA	Homo sapiens intermediate conductance calcium-acti	AF0330	26
GCACTGAATA			27
TTGCCCCCGT	H.sapiens mRNA for tyrosine kinase receptor.	X66029	28
GGCAACAAAG			29
GCGGGGTGGA			30
GAGGGGAAAC	Human p66shc (SHC) mRNA, complete	U73377	31

	cds.		
CCCGCCCCCG	H.sapiens LU gene for Lutheran blood group glycopr	X83425	32
GCTCAGGTCT			33
AATTGTCCGT			34
AAGGGCGCGG	Human lipocortin-III mRNA, complete cds.	M20560	35
CCCTGGCAGG			36
TACTTCACTG	Homo sapiens clone Dt1P1b11 mRNA, CAG repeat regio	U92983	37
GGCTCCCAAG			38
TTGGCGGGTC			39
ATCTGGGGCA			40
CCCCAGTGAG			41
CCTGTCATCC			42
CAAGGGTAAG			43
TTTAAAAAAA	EGR3=EGR3 protein [human, HG 6.6, Zap33, Zap5a, Za	S40832	44
TCAATAAAGA	H.sapiens QRSHs mRNA for glutaminyl-tRNA synthetas	X76013	45
GCTCTCAGGG	Human polyhomeotic 2 homolog (HPH2) mRNA, complete	U89278	46
CCTTGACCAA			47
CGGGGCGCGC			48
GAGTAGAGAA			49
CCCGGGAGCG	Homo sapiens carboxyl terminal LIM domain protein	U90878	50
CAGCGCTGCA	Human CDC37 homolog mRNA, complete cds.	U63131	51
GGATATGTGG	Human mRNA for early growth response protein 1 (hE	X52541	52
TGCTTTCAAA			53
GCCCAGCTCA	Human mRNA for 26S proteasome subunit p31, complet	D38047	54
GATCTCTTGG	H.sapiens CaN19 mRNA sequence.	M87068	55
GTTCGGGCCG			56
GGCAGGCACA	H.sapiens mRNA for phenylalkylamine binding protei	Z37986	57
GGCCCTAGGC			58
TAGAAAGGCA			59
GGCAGGCGGG	Human ets domain protein ERF mRNA, complete cds.	U15655	60
GGAGTGTGCT			61
TTCCGTTTCT			62
AAGCCCCTGG			63
ACCGGGGTGA			64

ACTGACTCCA			65
CCGAAAAAGT	Human mRNA for RanBP1 (Ran-binding protein 1), com	D38076	66
CCTGGACGCT			67
CTGAGGCGCT	Human thimet oligopeptidase (THOP1) mRNA, complete	U29366	68
GCCCAGCGGC			69
CAGTGCGTTC	Human heart protein (FHL-2) mRNA, complete cds.	U29332	70
CACACAATGT			71
CCCTGGTCCC			72
AAAACTTTTG			73
TGGGCCTTCC			74
ACCTCACTTA			75
TCCTGTAAAG			76
GGCTGATTTT	Human apobec-1 binding protein 1 mRNA, complete cd	U76713	77
GGTCGGAAAA			78
CCACCACCCA	Human mRNA for calretinin.	X56667	79
TGTTCTCCAT	Homo sapiens mRNA for OTK27, complete cds.	D50420	80
GTTTATGATC	Homo sapiens mRNA for 5-aminoimidazole-4-carboxami	D89976	81
TAAAAGACAA			82
AAGCTGTTCC	Human GP36b glycoprotein mRNA, complete cds.	U10362	83
TGTCTGTGCC			84
AGCTGGGTTG			85
GCCCAGCAGG			86
ACTCTCCCGT			87
TCTGTTCTGG	Human ubiquitin conjugating enzyme mRNA, partial c	L22005	88
TGCAATAGGG			89
AGCGGCCGCG	Human homolog of D. melanogaster flightless-I gene	U01184	90
TCTCCTGGAC			91
TGGGATGCGC			92
TTAATATATG			93
ATTGACCGCT			94
GCCAACCTGC			95
TTTATAAGTT			96
CCGCGTCCCT	Human peroxisome proliferator activated receptor m	L07592	97
TTTTTGATAA	Human HepG2 3' region cDNA, clone hmd2c11.	D16891	98
TTTTTGATCA	H.sapiens mRNA for beta-catenin.	X87838	99

CTTATGATCA			100
ACCTTCACCA			101
TCTGCAATGA			102
CCCCCCTTCT			103
CAGCCTTGCG			104
GTGTCGCGTG			105
CATTTCAGAG			106
TCAATCAAGA	14.3.3 eta chain=brain-specific tyrosine and trypt	S80794	107
CCCTGGAGAC			108
TTTTAAAAAT	Homo sapiens catechol-O-methyltransferase (COMT) m	M65213	109
TGAATCTGGG	Human set gene, complete cds.	M93651	110
ATTCTGCCTC			111
GGAAGGCGGC			112
CGGATGATTG			113
CTGAGGGTCG			114
GGTGAGGTGG			115
GTGTGTTTGT	Human transforming growth factor-beta induced gene	M77349	116
CCCCGTATGG			117
CGCGTGCACA	Homo sapiens TTF-I interacting peptide 21 mRNA, pa	AF0005	118
AAGAAGGCAC			119
AACGAGTACA			120
GATAGTTGTG			121
ACCAGCTCCC			122
GAACGTCTCT			123
CAGGGCGGTG			124
AAAGATGATG			125
TTAACTGTGT			126
ACACAGCCAA			127
ACAGCGTCTG			128
GAATCTGGAG			129
TTTGAGACCT			130
ATGTGAAGAA			131
GTGTACCGGA	Human cytohesin-2 mRNA, complete cds.	U70728	132
ATGCCTTGGG			133
ATCTGTCCCT			134
GGGGGCTGCT			135
CTCCTTAAGA			136
GCCGAGCCGC			137
ATGGTGGGCA	Human zinc finger protein (ZNF139) mRNA, partial c	U09848	138
TCTTCTAAAA			139

TCATAACTGT	Human mRNA for flavoprotein subunit of complex II,	D30648	140
TGGATGCTGT			141
AAAACTGCCT			142
TCCTTTGTGC			143
GCCCTCCGGC			144
GATGCGAGGA	Human semaphorin III family homolog mRNA, complete	U38276	145
CAGAGATGAA			146
CCACACCTCT			147
GACGCAGAAG			148
AGCGCCTTCC			149
ACGCTGCTGC			150
CAAGGGCCAA	Human RalGDS-like 2 (RGL2) mRNA, partial cds.	U68142	151
CTGCGGAAGA			152
CCTGGAATGA			153
CCTGAAATCC			154
CCTCGGAGAT	Homo sapiens 9G8 splicing factor mRNA, complete cd	L22253	155
CAGTTAGGGA			156
CACGGGTGTC			157
CAACTCAAAC	Human mRNA for tyrosine kinase, complete cds.	D31661	158
ATTTGGCTTT			159
ATTCTGCTTT			160
ATGGCAGAGA			161
ATGAGGCCGG			162
CTTGACACAC			163
ACGTCTCTAT			164
GACCCTGACT			165
AATACTTTTG			166
AAGGTGGAGA			167
AACTCTTCAC	Human beta adaptin mRNA, complete cds.	M34175	168
AACCACTGTG			169
TTTTGCTTTT			170
TTTCTCGGTG			171
TTGAACTGGC			172
TTAGTCAGGC	Human transmembrane 4 superfamily protein (SAS) mR	U01160	173
TTACCTTTTT	Human beta-galactosidase (GLB1) mRNA, complete cds	M34423	174
TTACCTTACC			175
TGTTCAGGAC			176
TGTCTGCCTG			177

TGTCCCCTCA	Human rac protein kinase alpha mRNA, complete cds.	M63167	178
ATCGTGCCAC			179
GTGTCCGGCG	Homo sapiens mRNA for U3 snoRNP associated 55 kDa	AJ0013	180
TTTCCAGCAT			181
TTAATAAAAT	Human GST1-Hs mRNA for GTP-binding protein.	X17644	182
TGCGCCTTTA			183
TGATGTTGGA			184
TGATGCAGCC	Human SNARE protein Ykt6 (YKT6) mRNA, complete cds	U95735	185
TGAATGTCAA			186
TCTGTAAGGG	Human mRNA for KIAA0129 gene, complete cds.	D50919	187
TCTGCAAATT			188
TCTCTACTAA	Human clone 3 Alu repeat sequence.	U02060	189
TCGCCCACTC			190
TCCTGCTGAT	Human mRNA for KIAA0079 gene, complete cds.	D38555	191
TAGGAAAGTA	Human tissue factor gene, complete cds, with a Alu	M27436	192
CTTACAACCG			193
GTTTTTAAAT	Homo sapiens putative oncogene protein mRNA, parti	AF0268	194
TGGAAGGACC			195
GTATTTGCAA			196
GTAGAAAAGA			197
GGGGAGCTCG			198
GCTGCTGCCT			199
GCTCCCGGAC			200
GCTATCTCAG			201
GCGGCGGCGA			202
GCCTGGGACC			203
GCAAGCCCAA			204
GATGGGGTTC			205
GATACACTGG			206
GAGAATCTGA			207
GACTCCACAT			208
TAACCAAACA			209
CCCCAAGACC			210
GAGAGTGTAC			211
GACCACACCG			212
GACACCAACT	Homo sapiens deubiquitinating enzyme UnpEL (UNP) m	AF0173	213
GAAGGAGATG			214

GAAGATTAAT	TCR alpha=T-cell receptor alpha chain {VDJ region,	S69283	215
CTTTGCTTTT	H.sapiens mRNA for PHAPI2b protein.	Y07570	216
CTGTCTGTGG			217
CTGGGGGTCT			218
CTCTGATGCA	H.sapiens mRNA for DNA polymerase gamma, mitochond	X98093	219
CTCTACAGTG	Homo sapiens mRNA for vacuolar proton-ATPase subun	Y15286	220
CGCCTGTAGT			221
CCTGGAGGGG			222
TGTAAGAAAA	Human mRNA for HsMcm6, complete cds.	D84557	223
CCCCTGCTAG			224
GCACGTGTCT			225
CCCCAAGACA			226
CCCAGCTAAT	Human 15-lipoxygenase mRNA, complete cds.	M23892	227
TCTCAGTGTC			228
CAGCGCACAG			229
CAAACCTTTA			230
CAAACCTTGT			231
ATTTTCAAAA	H.sapiens mRNA for gamma-adaptin.	Y12226	232
ATCTTGGCCT			233
ATCTCTGGAG			234
AGTTGAAATT			235
AGACCTCCTT			236
AGACAAGCTG	Human splicing factor SRp40-3 (SRp40) mRNA, comple	U30827	237
ACTGTTTGGC			238
CCGTCTTTCC			239
GGTTCTGTAG			240
ACTCGTGCTC			241
TGCCAAACGG			242
TGAAGAAAGG	Human integral membrane protein CII-3 mRNA, nuclea	U57877	243
TCTGGACCGG			244
TCTGCTAAAA			245
TCTCAGTGTT			246
TCCGCCGCCC			247
TCAGACCCAG			248
TATCTGCTGA			249
TACGTTGCAG			250
GTTGTAAAAT			251
GTGGAATAAA	latent transforming growth factor-beta-binding pro	S82451	252

GTCCTGGAGG			253
GAGGCGCTGG	Homo sapiens bcl-xL/bcl-2 associated death promote	AF0315	254
GCTGAGCTGG	Human alpha-N-acetylglucosaminidase (NAGLU) mRNA,	U43573	255
TGGTTGCGAC	Human branched chain aminotransferase precursor (B	U68418	256
GCCAGCGTCA	Homo sapiens spindle pole body protein spc97 homol	AF0423	257
GCCCCAGAAT			258
GCCGAGCTGG			259
GCCTGAGGGG			260
GTCCGAGTGC			261
GCTCACCTGT			262
GGTTTGGAAG			263
GGAAATGTCA	Human collagenase type IV mRNA, 3' end.	J03210	264
GGACTTTGAG			265
GGAGTAGGAA			266
GGGGCACTTG	H.sapiens mRNA for nicein B2 chain.	X73902	267
GGTGCAAAAG			268
GATGTCTTGT			269
GCTATGCTCC			270
GTCACTGCCT			271
GACTCGCCCA	H.sapiens P1-Cdc46 mRNA.	X74795	272
CCTGTCCAGC			273
CACTACTCAC			274
TTGAAGTGCG			275
TGCTGTGTGC			276
TAGTATTTTC			277
GCCCCACAGC			278
AGAGACAAGT			279
GGCCGCGTTC	Human ribosomal protein S17 mRNA, complete cds.	M13932	280
TGGAAAATTT			281
AATGTGATTT	Human prolylcarboxypeptidase mRNA, complete cds.	L13977	282
TGCCTGTGAA			283
TGCAGGTACT	Human mRNA for LIMK-2, complete cds.	D45906	284
ACATTCTTTT	H.sapiens NMB mRNA.	X76534	285
GCCTGCCTGA	H.sapiens mRNA for hair keratin, hHb3.	X99141	286
TGAGTTGGCC			287
TGGGTCTGAA			288
TGAAACTTTT			289
AATAAAAGAC			290

TGGAATGAGC	Human sarcomeric mitochondrial creatine kinase (Mt	J05401	291
ACGCCCACCT			292
TCCAAGTTCC			293
TCCAAAGCAT			294
TCAACTGGTT	H.sapiens mRNA for phosphoenolpyruvate carboxykina	X92720	295
TATTTATTGA			296
ACGGTCCAGG	Homo sapiens cytidine deaminase (CDA) mRNA, comple	L27943	297
TGAAGGTGGA	Human mRNA for KIAA0330 gene, partial cds.	AB0023	298
TTGGTTTTGT			299
AAAAACCATA	Homo sapiens transcription factor TFIIA small subu	U21242	300
TTTTGATGAG			301
TTTGCTTTTG			302
AACGGGCCGG			303
TTTGCTCTCC	Human vinculin mRNA, complete cds.	M33308	304
TGATTTCACT	Human autonomously replicating sequence (ARS) mRNA	L08441	305
TTTATTTCTA			306
AATCAAACAC	Homo sapiens DNA polymerase alpha mRNA, complete c	L24559	307
AAGGAAACGT			308
TGGAGAATGT			309
TTGCTGGAGA			310
TGTTTATCCT	Human endozepine (putative ligand of benzodiazepin	M15887	311
TGTACTACTT			312
TAGCAGCTGG			313
AAGGTAATAT	Homo sapiens microsomal glutathione S-transferase	U77604	314
TATATCAGTG			315
TGGCCAATAA			316
AACCAAAAAA			317
TTTACAGACC			318
GAGAAGGGCA			319
TATGATTACC	Human mRNA for platelet activating factor acetylhy	D63391	320
GCTGCTGGCA			321
GCTAATAGTA			322
GCCTCTTGAA	hCDC10=CDC10 homolog [human, fetal lung, mRNA, 231	S72008	323
GCCATCCAGA			324
GCCAGACCCC			325

GCACTCAATA			326
GATTTGAAAT			327
GATGAGGAAC			328
GGACTTAGAA			329
GAGCTTTTGA			330
GGATCCCAAC			331
GAGAAGACTT	H.sapiens mRNA for prolyl oligopeptidase.	X74496	332
GACGTCTTAA	Human mRNA for proteasome subunit HC9.	D00763	333
GACACGTGAC			334
GAAGTGGAAG			335
GAACATAGCC			336
CTTGATTAAA			337
CTGTGTAAGC	Human L-isoaspartyl/D-aspartyl protein carboxyl me	M93009	338
CTGATGGCAG			339
CTGAGACACC			340
CGTGCCGCCT			341
GAGTATCTCA			342
GTGCAGTACC			343
TAGACTGGCA			344
TACAAAACCA			345
TAACGAACAA			346
GGGAAGCAGA			347
TAACAGGAAA			348
CGAGGGGCCA			349
GTTTGTGATG			350
GTTGGTCCCT			351
GTGTCCTCCT	Human Golgi membrane sialoglycoprotein MG160 (GLG1	U64791	352
GCTTCTGCAT			353
GTGGCACCAC			354
AGCGTGGCTC			355
GTGATTCATT			356
GTCTCACGTG			357
GGTTGGCAGG			358
GGTACTCGAT			359
GGGCCGCTCA	Homo sapiens mRNA for KIAA0602 protein, partial cd	AB0111	360
GGGCCCCGCA	Human mRNA for KIAA0123 gene, partial cds.	D21064	361
GGGCAGAATT	Human mRNA for KIAA0370 gene, partial cds.	AB0023	362
GGGAGTGCGC			363
GGCTCAGCAG			364

GGCGCCAGCG			365
GTGTCCATCT	Homo sapiens tumor-suppressing subchromosomal tran	AF0199	366
TCAGTGGTAG			367
AGCAGCTCAC			368
TATAAATTTT			369
GCAGGCCTGC			370
GCAGAGAAGC	Human myogenic repressor I-mf (MDFI) mRNA, complet	U78313	371
GCAAATGCCG	Homo sapiens U4/U6 small nuclear ribonucleoprotein	AF0163	372
GATGTTGCTC			373
GATGTTAGTA			374
GAGTCTGAGG	Human mRNA for hU1-70K small nuclear RNP protein (	X06816	375
GAGGCAGCTG	Human GTP-binding protein (HSR1) mRNA, complete cd	L25665	376
GCCCACAAGT			377
GAGCAGGAGC	Homo sapiens mRNA for KIAA0600 protein, partial cd	AB0111	378
TACAGCGAGC			379
GAGAGACACG			380
TCCCAGAGAC	Human mRNA for beta-1,4-galactosyltransferase, com	D29805	381
GACACTGAAA			382
TCGCGGGCCT	Human clone 23882 mRNA, complete cds.	U79303	383
GAACTGCCTC	Homo sapiens FLICE-like inhibitory protein short f	U97075	384
GAAAGATTGG			385
CTTTTCACTT			386
CTTCCCACTC			387
CTTCAGAAAT			388
GAGCGGGATC	Human alternative splicing factor mRNA, complete c	M72709	389
GTGGCGTATG			390
GGTGGTCAGA	transcription factor E2F like protein [human, mRNA	S49592	391
GGTGCAGAGC			392
GTATACAACA			393
GTCATTTGGA			394
GGCTGTAAGT			395
GTGAACTTAC			396
GTGAGAAGTG			397
GTGAGCCACA			398
GTGATGTCTG			399

TACGATGAGT	Human low molecular mass GTP-binding protein (ral)	M29893	400
GGAGTCCCTT			401
CTGTACTAGG			402
GGAGCACACA			403
GTGTTCTGAC			404
GGACGGAAGT			405
GCTTGTTAAG	Homo sapiens S-adenosyl homocysteine hydrolase hom	U82761	406
GTTTCCACCG			407
GCTGCCAGCA			408
GCTCAACATC			409
GCGGGGTGAC	Human regulator of nonsense transcript stability (	U65533	410
TAATCAGGAG			411
GTGCTCCTAG			412
ATCGTGGCTG			413
CCCTGCTTCC			414
TTTTGGGCAG			415
CCCCTTATTT			416
TTTTGTACCA			417
TTTTTACTCA			418
CCAGTGGCTC	Homo sapiens myo-inositol monophosphatase 2 mRNA,	AF0143	419
CAGTGTATAT			420
CAGAAATGAA	Human ubiquitin-homology domain protein PIC1 mRNA,	U61397	421
CACTGTGTTG			422
TCTGCAAGCA			423
CAACTATCCG			424
TTGGCTTTTC			425
ATCCATTCTG			426
ATCCAGCAGA			427
ATCATCCAGG			428
ATCAGTGTGA	acidic calponin [human, kidney, mRNA, 1607 nt].	S80562	429
AGGTCAAGAG			430
AGGAAGGGGT			431
TCCAAATCGA	Human vimentin (HuVim3) mRNA, 3' end.	M25246	432
AGCCAGCCTA			433
CGGCACATCC	Human galactokinase (galK) mRNA, complete cds.	U26401	434
CACCACGGTG			435
CTACCCAACA			436
AGCACAGGGA	Human PML-3B mRNA, complete CDS.	M80185	437

CTGGCCATCG			438
CTGCCTTCTT	Human protein phosphatase-1 gamma 1 mRNA, partial	L07395	439
CTGCAGGACC			440
TGCAGCCGCT			441
TGCTGAGGAA			442
TGCTGGTGTG	Human mRNA, clone HH109 (screened by the monoclona	D23673	443
TGGAAAGCTT	Homo sapiens chick ovalbumin upstream promoter tra	M62760	444
CTCCAATAAA			445
TTTTACCAGT	H.sapiens mRNA for Icln protein.	X91788	446
CTACGTGATG	Nrf2=NF-E2-like basic leucine zipper transcription	S74017	447
CCCTTGTGAC			448
CGTTTTCTGA	Homo sapiens protein tyrosine phosphatase (PRL-1)	L39000	449
CGGGTAGTAT	Human acid alpha-glucosidase (GAA) mRNA, complete	M34424	450
TTAGCCAGGA	Human LLGL mRNA, complete cds.	D50550	451
CGCCCCCACA			452
TCGGAGCTGC	Human ras inhibitor mRNA, 3' end.	M37192	453
CCTGGGTCCT			454
TTGCCGCTGC			455
TTGGAGGAGT			456
CCTCCCCGAA			457
CTTAATGGTG			458
CTAGTCACTT			459
ACCCTTTAAC	H.sapiens HLA-E gene.	X56841	460
AACCAGGTGT	Human mitochondrial RNA polymerase mRNA, nuclear g	U75370	461
AAATGCCCTC	Human translational initiation factor (eIF-2), alp	J02645	462
GGCGTCCTGG			463
TCTGTTTCCA	Human tyrosine kinase (HTK) mRNA, complete cds.	U07695	464
AAGCTGTGTC			465
CAGCTGGGGC	Human polypyrimidine tract-binding (PTB) mRNA for	X60648	466
AAGTATTGTG	Homo sapiens phosphatidylinositol 4-kinase 230 (pi	AF0128	467
ATGTCATCAA	Human clathrin assembly protein 50 (AP50) mRNA, co	U36188	468
ACCAAAGCCC			469
AGCCTTTCCG			470
ACCCTTGGGC			471

ATGAACCGCA			472
ACCTCTCTAA			473
ACCTCTGGCT	Human homeobox protein (PHOX1) mRNA, 3' end.	M95929	474
ATCTCAAAGA			475
ACCTGCTTAA	nucleoprotein interactor 1=SRP1 homolog [human, ce	S75295	476
AAAAGAAACT	Human mRNA for polyA binding protein.	Y00345	477
AGAAATCACT	Human 3-hydroxyacyl-CoA dehydrogenase mRNA, partia	AF0019	478
TGGTCCACGG			479
GAGGGACCCA			480
AAGCAAGTCA			481
ACCAGCGTGT	Human mRNA for KIAA0150 gene, partial cds.	D63484	482
TTAAAGGCCG	Human MRL3 mRNA for ribosomal protein L3 homologue	X06323	483
GGCGTGAACC	Human cyclin protein gene, complete cds.	M15796	484
TAGTAGATGC			485
GCCAAGATGC			486
TAAGTTCCTT			487
CCAGCTGCCA	Human ubiquitin-activating enzyme E1 (UBE1) mRNA,	M58028	488
GCCCCGCCCT			489
TATCTGTCTA			490
TACCCCACCT			491
TCAGTGAACG	Homo sapiens p87/89 gene, complete cds.	L42572	492
CCTTTGTAAG			493
CAGCTCCGCT	Human deoxyuridine triphosphate nucleotidohydrolas	U90223	494
AAACTGACAG			495
GACCCCAAGG	Human cyclin mRNA.	M74092	496
TCGCCGGGCG	Human hindlimb expressed homeobox protein backfoot	U70370	497
GTGAAACACC			498
GTAGCATAAA			499
TCCTTGCTTC			500
GTAGACTCAC	Human HLA-B-associated transcript 2 (BAT2) mRNA, c	M33509	501
GCCCAGCCCT	Homo sapiens cDNA mapping to 22q13.	AL0216	502
GGTTAAGAGC	Human Lewis blood group locus mRNA for	X53578	503
AAAACAATGG			504

GACTAGTGCG			505
TGCGGAGGCC	Homo sapiens mRNA for p27, complete cds.	AB0017	506
CCAAAATTAG			507
ACCATCCTGC	Homo sapiens mRNA for cadherin-6, complete cds.	D31784	508
AGAGCAAGTA			509
ACTGCCTCTT			510
CACTCCAGCC			511
CAGACCCTGC			512
ACACACGCAA			513
CAGCCTTGGA			514
GGAACAAACA	Homo sapiens CD24 signal transducer mRNA, complete	L33930	515
AAAGGGGGCA			516
AGGCTGTCCA			517
GGGGGTAACT	TLS=translocated in liposarcoma [human, mRNA, 1824	S62140	518
CACGCGCTCA	Human mRNA for RPB5 (XAP4), complete cds.	D38251	519
CCAACAACTA			520
CCAAGAAAGA	Homo sapiens polyadenylate binding protein mRNA, c	U75686	521
CCCATTCCTC			522
TGGTTTTTGG			523
ACCTGGGGAG	Homo sapiens lysophosphatidic acid acyltransferase	AF0002	524
GAGCACATCA			525
TCCGAGACTG			526
GTGCCTGAGA	Human lamin A mRNA, 3'end.	M13452	527
TACTGGAAGT			528
CCTGTCAATG			529
CATTGAGCTC			530
TCTGCTAAAG			531
CGCTGTTTTT			532
AGGGATCCTA			533
AGTGAAATAA			534
AGTGTCTGTG	H.sapiens CYR61 mRNA.	Y11307	535
ATCACGCCCC			536
ATCCACCCGC	general transcription factor IIE 56 kda subunit [h	S67859	537
ATCTCCAGGT			538
ATCTTGAAAG	H.sapiens NAP (nucleosome assembly protein) mRNA,	M86667	539
AGCCTGTTGC			540
AAACTCGGGT			541

CCACACACCG			542
AAGATTGGTG	Human CD9 antigen mRNA, complete cds.	M38690	543
CAAAGGAAGC	H.sapiens (TL15) mRNA from (DU145) cell line.	X75689	544
CGGCTCAAGT			545
CGTGCTGGCC			546
CCCTTAAGTT			547
CCCAGGGCTC			548
ATGGTGCTGA	Human SREBP-1 mRNA, complete cds.	U00968	549
TGATTTTCTT	SC1=putative trans-acting factor involved in cell	S53374	550
TCTTCGTCCT			551
TCTTTGATCT			552
TCTGCCTGTC			553
TGAAGAATGG	Homo sapiens trinucleotide repeat 5-d(CGG)n-3ds bi	AJ0002	554
GCTGAAGATG			555
TGATGGGCAT			556
GCTGAAACTT			557
TTGCTTAGTT	Human mRNA for KIAA0326 gene, partial cds.	AB0023	558
TGTGAGCCTC	H.sapiens mRNA for cyclin F.	Z36714	559
GCGGCCCTGG			560
TTCCTCCAAA			561
TTCTCAAGGC			562
TTCTCTCCAC			563
TTCTTTTTCT			564
TTCAATTTCA	Homo sapiens amplaxin (EMS1) mRNA, complete cds.	M98343	565
GCGACTTTTT			566
TTATGGATCT			567
GCGAAGGCTC			568
GCCTTTCTAA	Homo sapiens ribosomal protein S6 kinase 2 (RPS6KA	L07597	569
TTGGCAGTAT	Homo sapiens epsilon-sarcoglycan (ESG) mRNA, compl	AF0363	570
TTGGCCCAGG			571
GCCTAGTACT			572
TTGTGAGAAT			573
TTTGAGTTTT			574
TTGCAAAGGG			575
GCTAAACAGG			576
GCTCCAGCTA			577
TGGAAATAAA			578

TGGCAAGATG			579
TGGCTTGCTC			580
TGGTGGAGGC			581
TGGTTTGCAC			582
GCGGTGGCGG			583
GCTACTATTA			584
GCTCTGAAGG			585
TGTATGTCGC			586
TGTGGGGCTC	H.sapiens mRNA for histidyl-tRNA synthetase.	Z11518	587
TGTTCCACTC			588
TGTTTATAGA			589
GCGTGACTTC			590
TTAAAGATTT	Homo sapiens mRNA for alpha-tropomyosin (3' end).	AJ0001	591
TTAGCAGTTG			592
TGTATGCCGT			593
GGCGTTGTCT			594
GCTTTTATAC			595
GGACCAGGCT			596
GTTGGGTCAG	H.sapiens mRNA for TIM17 preprotein translocase.	X97544	597
GTTCTAAACC			598
GGAGGCGGAG			599
GTTCCAGTGC			600
GGAGTTGTCC			601
GGATCTCCCA			602
GGCATAGGCT			603
GGCCCCCCTC	Human mRNA for KIAA0295 gene, partial cds.	AB0022	604
GTGGATGTAC			605
GGCCCCCTAA			606
GGCCTATGAG			607
TATGGGTTCC			608
GTGAAACTCT			609
GGGGCAGCCG			610
GGGCTGCTCT			611
GTACTGTATG	Homo sapiens importin beta subunit mRNA, complete	L38951	612
GGGCGATACA	Homo sapiens mRNA for PCDH7 (BH-Pcdh)a, complete c	AB0067	613
GGGCCCTTGG			614
GTGCCACCAG			615
GTCTGGGGGC			616
GGCGACGAGG			617
GTGAAATCCT	Homo sapiens mRNA for putative lipoic	AJ2241	618

	acid synthet		
GGCTTTGATT	H.sapiens subunit of coatomer complex.	X70476	619
GGCTGCCTGC			620
GTGACGCCCC			621
GGCTCTTCTG			622
TAAGTGTGGT			623
GTCTCCCGGC			624
TCCAGACAGC	Human Hpast (HPAST) mRNA, complete cds.	AF0014	625
GCTTCGTTAC			626
TCACAAACTG			627
TCACAATACA	Human cyclophilin-40 mRNA, complete cds.	L11667	628
TCACGCTGCT			629
TCAGGGCATT			630
TATTCAATTA			631
TCATCTTTGT			632
GCCCTGGAGC			633
TCCGTGTGTC			634
TCGGGAGCTG			635
TCGGGTGTGG			636
TCGGTTACAA			637
TCTACAAAAA			638
TCTGCAAAAA			639
TCATATGTGT			640
TACCTTTATT	Human serine kinase mRNA, complete cds.	U09564	641
TCTGCAAAGG	Homo sapiens for mRNA encoding HMG2B.	Z17240	642
GCTGTATAAT			643
TAATTAACTC			644
TAATTTTTCT	Homo sapiens clone 23705 mRNA sequence.	AF0353	645
TACAGCCACT			646
TATTGTGTGT	Human mRNA for mitochondrial 75 kDa iron sulphur p	X61100	647
TACCCCCGAG			648
GCTTCCCCAC	T3 receptor-associating cofactor-1 [human, fetal l	S83390	649
GCTGATCTAC	Human casein kinase I delta mRNA, complete cds.	U29171	650
TATAGTGGCT			651
TATGAACTGA	Human poly(ADP-ribose) polymerase mRNA, complete c	M32721	652
TATGACCACA			653

AAGTGCATTT			654
TATGGACCTG			655
GCTGGGTAAC			656
CAAGGAGATC			657
AAGGTGGCCA	Homo sapiens mRNA for KIAA0540 protein, partial cd	AB0111	658
CTTTACTGTG			659
CAACCCACGC			660
CTTGTGTTAT			661
CTTGTGAAGT			662
CTTGAATTGC			663
CTTTGCACTC	Human transcription elongation factor (SII) mRNA,	M81601	664
CTGGTGGCAT			665
CTTTTCCTGA	H.sapiens mRNA for TRAMP protein.	X63679	666
CTGGTGATGG			667
CAATGGAGCT			668
CTGGGATCAT			669
CTGGCAGGCC			670
CACACTACTA			671
CACCACGGGC			672
CTGTGACACA	Homo sapiens chaperonin containing t-complex polyp	AF0262	673
ATTTCAAAAG			674
ATGGATGCAC			675
ATGGCCTCCT	Human syntaxin mRNA, complete cds.	U07158	676
ATGTAGAATG			677
ATGTCATCTG			678
GAAGTTGCCT			679
ATGTTTGAAG			680
CTTTCCCTTG			681
ATTGTCAGGG			682
CTGAACCTGA	Human CD39L1 mRNA, complete cds.	U91510	683
ATTTCTACCT			684
CAAACTTCCG			685
GAAGAGGATG			686
GAACGTCTTA	H.sapiens son-b mRNA.	X63751	687
GAACCTGGAC			688
CTTTTTTTTG			689
ATTGAGCCAC			690
CCCTCCAGCT			691
CCACCGCACT			692
CCAGCGCCAA			693
CCTTTCAAAA			694
CCCAAGTAGC			695
CCCGCATTAG			696

CCTTACCCAG			697
CACCCTGTAC	Human placental equilibrative nucleoside transport	U81375	698
CCCGTCCAAG			699
CATTGTGCAC			700
CCCTGACCAA			701
CCGACCACAA			702
CCGTTCCAAG			703
CCTCTCCCAC			704
CCTACCACCA			705
CCTCCCCCTC			706
CCCGTAGCCC			707
CGGCTGACAG			708
ATCCTGTGGA			709
CACCTCTCAT	Human lysyl oxidase-like protein mRNA, complete cd	L21186	710
GTACCTAGAG			711
CCTGTCTAGC			712
CTCCTGTGCC	Human mRNA for transcriptional activator hSNF2b, c	D26156	713
CGGTTTGCAT			714
CCAAGAAGGT			715
CAGAGACGGT			716
CATTTGGCCA			717
CAGGCAGGCT			718
CAGGCCTCTG			719
CAGGGAAGCC	H.sapiens mRNA for human giant larvae homolog.	X87342	720
CGCTGTGGGG			721
CGCCTATAGT			722
CGCCGGGGGC			723
CTGCTGATCT			724
CACTGCAGCA			725
CACCTCTCCT			726
AACACGAATG			727
AACTCTCCTA			728
AACTTGATGG			729
AAGATTTTAG			730
AAGCATATGG			731
AAGCTGCAAA	H.sapiens mRNA (clone ICRFp507L1876).	Z69915	732
AATACACTTG			733
AAGGACCAGC			734
AAATTGATGC			735
GATGTGACTG			736
AAGTTTGTGG			737

GATGCTAACC			738
GATGCGTGCC			739
GATCCTTGGT			740
GAGAAAGAGG	H.sapien tyrosinase and mutant tyrosinase, complet	M74314	741
AAGGACATTC	Human laminin B2 mRNA, 3' end.	M27654	742
AAAAGCTTGA			743
GCCCGGCACG			744
GCCCCTAAAC			745
GCCAGGTTAC	Human mRNA for KIAA0271 gene, complete cds.	D87461	746
GCCAAGTTTG			747
GCAGGGCCAG	Human faciogenital dysplasia (FGD1) mRNA, complete	U11690	748
GCAGCTCAAA			749
GATTCAACGC			750
GCAGCGCTGG			751
GCACCCACTG			752
AAAGGTGATA			753
AAAGTGGAAA	Human TFIID subunit TAFII55 (TAFII55) mRNA, comple	U18062	754
GCAGCAGGAA			755
AAATGGCTTG			756
GCACTCCAGC			757
GCACCTCCTA			758
AATGAAAAAA	Homo sapiens Rad51C (RAD51C) mRNA, complete cds.	AF0296	759
TTTTTGAATA			760
GAGGATTTGG			761
AGGAGAGGGC			762
AGGATTAAAA			763
AGGCCCACAA	Homo sapiens alpha-mannosidase (6A8) mRNA, complet	U37248	764
AGGCCCTGCT			765
AGGCTCCGTG	Human mRNA for KIAA0223 gene, partial cds.	D86976	766
AGGCTGCGCT			767
GAGTGGAGAG			768
AGGGGCGCAG	H.sapiens mRNA for protein containing SH3 domain,	X99656	769
AGCAAGTCTC	Human liver 2,4-dienoyl-CoA reductase mRNA, comple	U49352	770
GAGGAGTGGG			771
AGTTGTCCCG	Homo sapiens clone 24561 unknown mRNA, partial cds	AF0550	772
GAGCCATTTG			773

ATCCAGGGTC			774
ATCCTGATGG			775
TTTGTGTCAC	Human chromosome 3p21.1 gene sequence, complete cd	L13434	776
GAGGCGAGGC			777
ACCTATCCAA			778
AATTTGTGAA			779
ACAGAATGCC			780
ACAGACACTT			781
GAGTCGTAAT			782
GAGTCCGGAG	H.sapiens mRNA for neurotensin receptor.	X70070	783
ACCCCCAAGG			784
AGCCCTTTTT	Homo sapiens transcription factor (CBFB) mRNA, 3'	L20298	785
ACCTACAGCG			786
AGCCATTGTG			787
ACTGCCCCAA			788
ACTTACCTGG			789
AGAAGGATCT	Homo sapiens mRNA for SPIN protein.	Y14946	790
AGAATTTAGG			791
AGACGCACTC			792
AGCAAGCTGC			793
ATGACTAGCG			794
ACCCTGCCAA			795
GCCTCCTCCC			796
GCTCTGGGCG			797
TCTACTTTTG	Human DNA polymerase delta small subunit mRNA, com	U21090	798
CTCCACAAAT			799
ATCCAGTCTG			800
CTGCAGGCCC			801
GCCGCCATCT	Human transketolase (TKT) mRNA, complete cds.	U55017	802
TGATTAAGGT			803
TTCCTGCCCC			804
AGACCAAAGT	Human mRNA for heat-shock protein 40, complete cds	D49547	805
TCCTTCTCCA	Human mRNA for alpha-actinin.	X15804	806
CCCCCACCTA	Homo sapiens differentiation-dependent A4 protein	L09604	807
AAGGTCGAGC	Human ribosomal protein L30 (homologue of yeast rp	M94314	808
AAAAATAAAG	Human novel transcript from adenocarcinoma cell li	U28250	809
GGCTCGGGAT	Human mRNA for calcium activated	X04366	810

	neutral protease		
CCAGGAGGAA			811
GCAGTGGCCT	Homo sapiens ezrin-radixin-moesin binding phosphop	AF0159	812
TTCCTGACTA			813
CCTTTGCCCT			814
GAAAGAGCTG	Human H2A.X mRNA encoding histone H2A.X.	X14850	815
AAGCTGAGTG	Human M4 protein mRNA, complete cds.	L03532	816
GTGGCGCACA	26 S protease subunit 5b=50 kda subunit [human, He	S79862	817
CTGGCCCGGA	Homo sapiens encoding vasodilator-stimulated phosp	Z46389	818
CTCTCACTCT			819
GAATTTTATA	Human peripheral benzodiazepine receptor (hpbs) mR	M36035	820
AGTTTCCCAA			821
TGGCCTCCCC	H.sapiens mRNA for rho GDP-dissociation Inhibitor	X69550	822
TGAGAGGGTG	H.sapiens mRNA for HS1 protein.	X57347	823
GGGAGCTGCG			824
GACAATGCCA	Human mRNA for ATP synthase gamma-subunit (L-type)	D16562	825
CTCCTGGGGC			826
GGTGGCACTC	Homo sapiens RHOA proto-oncogene multi-drug-resist	L09159	827
CTGGCCCGAG	Human GDP-dissociation inhibitor protein (Ly-GDI)	L20688	828
ATAGTAGCTT	Human actin bundling protein mRNA, complete cds.	U09873	829
AAGAGACAGT	Human RNA polymerase III subunit (RPC62) mRNA, com	U93867	830
AAATCGATGA			831
AACACTGACT			832
AACCAATACA			833
AACCACCCAG			834
AACCCCAGCC			835
AACCCGGAAG	Human butyrophilin (BTF4) mRNA, complete cds.	U90546	836
CCAAACGTGT	Human HepG2 3' region MboI cDNA, clone hmd1c12m3.	D17130	837
AACTTGCCAA	Human high-affinity copper uptake protein (hCTR1)	U83460	838
AAACTGAATA			839
AAGATCAAGT			840
AAGGACAGTG			841

AATAAACGTG			842
AATTCTCCTA			843
AATTTACTTC	Homo sapiens ras GTPase-activating-like protein (I	L33075	844
ACAGCCAAGA	Human diadenosine tetraphosphatase mRNA, complete	U30313	845
AACTACCAGA			846
GGGGGAATTT			847
GTGAGCCCAT			848
CTAGCTTTTA			849
CCCCCGCGGA			850
CAGATCTTTG	Human UbA52 placental mRNA for ubiquitin-52 amino	X56999	851
TAGATAATGG			852
GGCTCCCACT	Human 90-kDa heat-shock protein gene, cDNA, comple	M16660	853
AAAGTTTGAG	H.sapiens OB-RGRP gene.	Y12670	854
CCCAAGCTAG	Human mRNA fragment for estrogen-regulated 24k pro	X16477	855
AAAGAACAGA			856
CATTTGTAAT	Human HepG2 3' region cDNA, clone hmd3c12.	D16914	857
GGAGTGGACA	Homo sapiens ribosomal protein L18 (RPL18) mRNA, c	L11566	858
ATCACGCCCT			859
TCAGACGCAG	Human prothymosin alpha mRNA, lymphocyte clone pIF	M14794	860
TGGCCCCACC	Homo sapiens Opa-interacting protein OIP3 mRNA, pa	AF0254	861
AAACAGCTCC			862
GTAAGTGTAC	12S rRNA [human, rRNA Mitochondrial Partial Mutant	S64650	863
ATTAACAAAG	Human guanine nucleotide-binding protein G-s, alph	M14631	864
GTGGGAGACC			865
TGGGAAAACT	Homo sapiens clone B1-6 zinc finger protein mRNA,	AF0271	866
AGGTACTACT	Human epithelium-restricted Ets protein ESX mRNA,	U66894	867
AGGGTGAAAC	Human splicing factor SRp30c mRNA, complete cds.	U30825	868
ACGCCCTGCT	Homo sapiens protein kinase gene, 3' end of cds an	M94203	869
ACCGCAATGC			870
AAGGAAGCAA	Homo sapiens mRNA for nucleolar protein hNop56.	Y12065	871
CAGCTGGCCA	H.sapiens mRNA for fibulin-1 C.	X53743	872

TAGTCCCTCT	H.sapiens mRNA for PHAPI2a protein.	Y07569	873
CAGGTTGTCC			874
GCAGGGTGGG			875
CAAAAGGCTC			876
ATTCTTCGGA			877
AGGCTGGATG	Homo sapiens clone 23912 mRNA sequence.	AF0381	878
ACCGAAACTT			879
ACCCCACCCA	Human clone 23552 unknown mRNA, partial cds.	AF0071	880
TGACTGGCAG	Human lymphocytic antigen CD59/MEM43 mRNA, complet	M34671	881
GAGTGGCTAT	Homo sapiens mRNA for GDP dissociation inhibitor b	Y13286	882
TGGTGGACTT			883
TCGGAGAAAA			884
TAAAGGTTTT	Homo sapiens transcriptional coactivator ALY mRNA,	AF0470	885
GTTGTAGACT			886
GTCCAGTCTC			887
GGCTCCTTGA			888
CAAGACAGAA			889
GCAGACTCAG			890
TGGGCCTGTG			891
GAGGGCCTTG	H.sapiens TSC2 mRNA for tuberin.	X75621	892
CTTCTCAGGG			893
CTCGGTGATG	Homo sapiens mRNA for ras-related GTP-binding prot	D78132	894
CTCCTGAAGG			895
CGTGTGCCTG			896
CCCTGGTGGG			897
GCGGAGAGAG			898
GTGGGTGTCC			899
CTGGGAGGAG	Homo sapiens tetraspan (NAG-2) mRNA, complete cds.	AF0228	900
CCTGTGGTCC			901
AGAAGTATAG	MB1=proteasome subunit MB1 [human, JY T-cells, mRN	S74378	902
AATGAGAAGG			903
GGTAGCCTGG	Homo sapiens Hepatitis B virus X-associated protei	L40326	904
ATGTGGCACA			905
TTCGGGTGTG	Homo sapiens protein kinase (HSTPK13) mRNA, comple	L19559	906
TTGGCCAGGA			907
GCGCCGCCCC			908

GACGGCCAGA			909
CGAGGGCACT	Homo sapiens beta III spectrin (SPTBN2) mRNA, part	AF0264	910
CCCCCTCGTG			911
AATCTTGTTT			912
AACGCGAACA	Homo sapiens mRNA for IgE autoantigen.	Y14314	913
TCACCGGTCA	Human mRNA for plasma gelsolin.	X04412	914
ATGTACTCTG	Human inosine-5'-monophosphate dehydrogenase (IMP)	J04208	915
GAAACCGAGG			916
ACCCCTGAGA			917
TGATCTGCCT			918
GGGTGGGGTT			919
GGCTGGTCTC			920
GCTGGGGTGG	Human Fas-associating death domain-containing prot	U24231	921
GCCAGGAAGC			922
CTTCTACTAA			923
GCACCGCCGG	H.sapiens mRNA for stress activated protein kinase	Y10488	924
GCAGGTCAGC	Human branched chain alpha-keto acid dehydrogenase	J04474	925
CCTCAGGCTC	Human transcription factor LZIP mRNA, complete cds	U88528	926
ATGTAGAGTG	Human mRNA for thymidylate synthase (EC 2.1.1.45).	X02308	927
ATCAAGAATC			928
AAGTTGCTAT	Human mutant cerebroside sulfate activator protein	M60258	929
AAGAAAACTG			930
AAAAGAGAAA			931
TTCGCTGAGG			932
GCAGGAACAG			933
GAGGAATATG			934
ACAGTGCTTG	Human phosphatase 2A mRNA, partial cds.	J03805	935
GACATTTGTC			936
GACCACAAAT			937
GACCATTTGA	H.sapiens mRNA for Sec23B isoform, 2450bp.	X97065	938
GACTCTGAAA			939
GAGACTCCAC			940
GACAAGGAAG	Human pancreatic beta cell growth factor (INGAP) m	U41737	941
GAGCAGGGTG			942

GAATAAACAT			943
GAGGTCCTTC			944
GATGGTGGAA			945
GATGTTGTCC			946
GATGTTTGAA			947
GATTCTAGCC			948
GATTCTTTTC	Human transposon-like element mRNA.	M23161	949
GAGAGGACAG			950
CTGCTTCCTG			951
CTCCAGGACA	H.sapiens mRNA for transketolase-like protein (285	X91818	952
CTCCCTCTGC			953
CTCTGCCCTC			954
CTCTTAATGT	Human homeodomain protein DLX-2 mRNA, 3' end.	L07919	955
CTGAAAATTG			956
CTGACCAGAG			957
GACAATGAGA	H.sapiens mRNA for NAD (H)-specific isocitrate deh	Z68907	958
CTGATCCCCC			959
GCATTGATGT			960
CTGTAACATA	Human mRNA for phosphatidylinositol-glycan-class C	D85418	961
CTTATTCCTT	Homo sapiens spleen mitotic checkpoint BUB3 (BUB3)	AF0474	962
CTTCTGCAAA			963
CTTGGTGTGC			964
GAAAAATTTA	Human unknown protein from clone pHGR74 mRNA, comp	M38188	965
GAAGAGTCTC			966
CTGAGCGCCT			967
GGGAAGGGCG			968
GGCAAACTTT			969
GGCAGAGGGC			970
GGCAGCTGGC			971
GGCCCACTAG	Human mRNA for KIAA0095 gene, complete cds.	D42085	972
GGCCCCATTT	Human carbonyl reductase mRNA, complete cds.	J04056	973
GGCGTTTAGA			974
GATTTTTCAT			975
GGCTGTGGCC			976
GGAGAGGGCA			977
GGGATCGCCC			978
GGGCAGATGC			979
GGGCAGGACC			980

GGGCTCCTGT			981
GGGGCAGAGA	Homo sapiens myristoyl CoA:protein N-myristoyltran	AF0205	982
GGTTGATCAC	H.sapiens mRNA for -14 gene, containing globin reg	X90857	983
GGCTGAGAAT			984
GCCTCTGCCA	Human mRNA for KIAA0272 gene, partial cds.	D87462	985
CTCAGGAAGC	Homo sapiens GTPase-activating protein (SIPA1) mRN	AF0297	986
GCCAAAACCT			987
GCCAGACGTG			988
GCCCCTGCTG	Human type II keratin K5 mRNA, 3' end.	M19723	989
GCCCGCAGGG	Homo sapiens dishevelled 1 (DVL1) mRNA, complete c	AF0060	990
GCCGCTCCTG			991
GGAGGGACCT			992
GCCTAGCTGG			993
GGAGCCAGGC	H.sapiens GSTT1 mRNA.	X79389	994
GCCTTCAAAC			995
GCCTTGGCAG	Human iroquois-class homeodomain protein IRX-2a mR	U90304	996
GCTGCCTACG			997
GCTGGATGCA			998
GCTTAATAGT			999
GGAAAATACT			1000
GCACAGTGAG	Human small GTP-binding protein mRNA, complete cds	U57094	1001
GCCGTCGGAG			1002
ATGTTGATTT			1003
ATCACTAAAG			1004
ATCCCTCATC	Human mRNA for Apo1_Human (MER5(Aop1-Mouse)-like p	D49396	1005
ATCGGCCGTA			1006
ATCTCGGCTC			1007
ATGAAAAGAT			1008
ATGCCTGGTA			1009
CATTTGAAAG			1010
ATGTAGGTGC	Human clone 23748 mRNA, complete cds.	U79294	1011
AGTTGGACGG	Human DNA ligase I mRNA, complete cds.	M36067	1012
ATTAAAGTGC			1013
ATTGAAAGCA	Human 5-hydroxytryptamine7 receptor isoform d mRNA	U68488	1014

CAAAGCGAGG			1015
CACTCCGCTT			1016
CAGCAGCAAA			1017
CTCATTCAGC			1018
ATGCGGGAGA			1019
AGAAGTACTG	H.sapiens RR1 mRNA for large subunit ribonucleotid	X59617	1020
GTACCCGTAC			1021
ACCGGTCCGG			1022
ACGACAAAGC	Homo sapiens clone 23731 peptidylglycine alpha-ami	AF0353	1023
ACTATCCTGA			1024
ACTCCAGTCA			1025
ACTGGCGAAT			1026
ATCACACCCC			1027
AGAAGAACGA	Human deoxyhypusine synthase mRNA, complete cds.	U26266	1028
ATAAAGTAAC			1029
AGCAGCTTTC			1030
AGCCAGGAGC			1031
AGCCTCTGCC	Homo sapiens katanin p80 subunit mRNA, complete cd	AF0524	1032
AGGAAAAGCT			1033
AGGAAAAGTG			1034
AGTCTAGCTA			1035
CCACTCTGGC	H.sapiens mRNA for processing a-glucosidase I.	X87237	1036
ACTGGGTGCA			1037
CTACAATTTT			1038
CCTGTGTGCA			1039
CGCCTATAAT			1040
CGCGGGCCCG			1041
CGGACAGCCA	Homo sapiens clone 24815 unknown mRNA, partial cds	AF0550	1042
CGGGATGCAG			1043
CGGGGTTCTT			1044
CATTGCGGAT			1045
CGTTCTGCGG			1046
CCTGGGCACT			1047
CTACCAGCAC			1048
CTACGAGTGA	glyoxalase I [human, HeLa cells, mRNA Partial, 572	S83285	1049
CTATAGCATA	Human amphiregulin (AR) mRNA, complete cds, clones	M30704	1050
CTCAAGCACC			1051
CTCACCTGCT			1052

ACCATAATGT			1053
CGTCAAGATT	Human farnesyltransferase alpha-subunit mRNA, comp	L10413	1054
CCGCTGCTTG	H.sapiens HSJ1 mRNA.	X63368	1055
CCCAAAGGCC	Human Treacher Collins syndrome (TCOF1) mRNA, comp	U76366	1056
CCCCGATCTT			1057
CCCCTCCCCC	Human velo-cardio-facial syndrome 22q11 region mRN	U84524	1058
CCCTCACTCC			1059
CCCTGCTTGT			1060
CCCTGTCTCC			1061
TTAGTTAAGC	H.sapiens mRNA (clone p5) for archain.	X81198	1062
CCGCCTTCTC			1063
CCTGGTCCCC			1064
CCGGGCGTGG			1065
CCTAACGTGT			1066
CCTCCTTCCC	Human crystallin beta-B2 mRNA, complete cds.	L10035	1067
CCTCTGGCAG			1068
CCTGACCCTG			1069
CCTGCCCACC	Human phenylethanolamine N-methyltransferase mRNA,	J03727	1070
CTCAGTCCCC	H.sapiens mRNA for galectin.	Z49107	1071
CCGATTTTTA			1072
TGTGACATCC			1073
GTGTCTCCCG			1074
GTGGTGTACA			1075
TGCTGCTGCC			1076
GTGGTGGACG	Human growth/differentiation factor 1 (GDF-1) mRNA	M62302	1077
TGGAGCCTAA			1078
TGGCTAAAAA			1079
TGGTAGATGC			1080
GTGGCCGTGG			1081
GTGGCCACCC			1082
TGGTTCTATA			1083
TGTACTTTCC			1084
TGTCAGGAAC			1085
GTGACATCTC			1086
GTGCTGGTAG			1087
GTTATTGTGG			1088
TCTCCTGGAA			1089
TGTGTACTGC	Homo sapiens NBMPR-insensitive nucleoside transpor	AF0341	1090

TATACAGATT			1091
TCTACCTGAT			1092
TTAAAAGTCA			1093
TCGGAGGCCT			1094
TATCTTTATA			1095
TTAGTTCGAC			1096
TTCAAAGGAA	Human mRNA for KIAA0051 gene, complete cds.	D29640	1097
TATGAGCACA			1098
TTCCATAGCC	Homo sapiens Notch3 (NOTCH3) mRNA, complete cds.	U97669	1099
TTCCCAGCTC			1100
GTGACGTGCA			1101
GTTTGCCTGA			1102
GTTTCCAGGT	Human clone 23627 mRNA, complete cds.	U79266	1103
TGACTCTTGA			1104
TAAATTCACC			1105
TAATCCTCAA			1106
TGACCTATTT			1107
TAATTTGCAT	Human epithelial membrane protein (CL-20) mRNA, co	U77085	1108
TAAACCTAGG			1109
TAAAAGAGGG			1110
TACACCCGCT	Human DNA repair helicase (ERCC3) mRNA, complete c	M31899	1111
GTTTTCAAAA			1112
GTTTGTTTCC			1113
TGAAGAGAAT	Human zinc finger protein RIZ mRNA, complete cds.	U17838	1114
TCACAGGGTC			1115
TACATATGGT			1116
TGCGACCGCA			1117
TGAAAGTAAC	Human clone 23711 unknown mRNA, partial cds.	AF0071	1118
TAGCAGATTG	Homo sapiens (clone p5-23-3) mRNA.	L48692	1119
TACTCAGAGG			1120
GTTGGGTAGA			1121
GTTTAAAAAA			1122
TGCCTGGAAC			1123
GTTTGATTCC			1124
TGCCATTAAG			1125
TGCAAAAAAA			1126
TACGGCTCGC			1127
TGCAGGCTCC			1128
TACCCAGGGC			1129

TGAAATGAAG			1130
TGCAAATCAG			1131
TGCCTTCAGG			1132
GTTTATGGAT	Human matrix Gla protein (MGP) mRNA, complete cds.	M58549	1133
TCATCCCCCA			1134
TTTCCTGTGT			1135
TCAGACTTTG			1136
TCCCTGCCCT			1137
TTTTGAGCTT			1138
TTTCCACACC			1139
TTCCTGTGCG			1140
TTTTACATCT	Homo sapiens thyroid receptor interactor (TRIP10)	L40379	1141
GGTTTTAGTT			1142
TTTATTTGGC	Human lamin B receptor (LBR) mRNA, complete cds.	L25931	1143
TGGAGTGTAC			1144
TCACTACTGG	Homo sapiens protein regulating cytokinesis 1 (PRC	AF0445	1145
TTTTCTATTT			1146
GTATTCTCTT			1147
TTGTTGGTCA			1148
GGGGTACCCC			1149
TCAACAGCGT			1150
TTCTTGCAGC			1151
TCGGAGCCCC			1152
TTCTTGGGAT			1153
TCCCAGGTCC	Human mRNA for bcr (breakpoint cluster region) gen	X02596	1154
TCCGCTTCGG			1155
GGGGGGTGGA			1156
GTCGGACACT			1157
TTGCCTAGGC			1158
TTGGGGAGGG	H.sapiens mRNA for DNA glycosylase.	Y11731	1159
TTGCCTTTTT			1160
GGGCCAAAAC			1161
GCTTACCTTT			1162
ATACATTTAG	H.sapiens mRNA for CI1 protein.	X81625	1163
GGAAAGCTGC			1164
GGGACGGCGC			1165
GGTGGGAACT			1166
GGTGCCCGGC			1167
GGTGCCAAAA			1168
ATGGCAAGGG			1169
GGCCAGGAAG			1170

GGGGATGGGG			1171
GGCTTTCAGC			1172
GGGCCTTGGA	Human mRNA for platelet-derived growth factor B ch	X02811	1173
GGGCCAACCC			1174
GGGGTAAGAA	Human mRNA for human homologue of rat phosphatidyl	D16111	1175
GGCTTCCTGG			1176
CCCACCCCCA			1177
CTCTGGAAAT			1178
CCACTACACT	Human TNF-related apoptosis inducing ligand TRAIL	U37518	1179
GTAATCCCCG			1180
CTGCAGACCC	Human peroxisomal enoyl-CoA hydratase-like protein	U16660	1181
GGCTCGGGGA			1182
GGTTGTCTAA			1183
GAAAACAAAG	Human acidic keratin-10 mRNA, complete cds.	M19156	1184
GAAAAGTTGC			1185
GAAACCCTCA	Human NOF1 mRNA, complete cds.	U39400	1186
GAAACTAGGA	Homo sapiens Shab-related delayed-rectifier K+ cha	AF0434	1187
GAATCAGAAG			1188
GCGGACCCTG			1189
GAGGGCCGTG			1190
ATTAAGAAAA			1191
GATTATTGGG	Human selenium donor protein (selD) mRNA, complete	U34044	1192
GCAGAAAGTT			1193
GCAGAGCCTT			1194
CAGCTATTTC	Human fatty acid binding protein homologue (PA-FAB	M94856	1195
GGTTATTTTG	Human mRNA for plasminogen activator inhibitor (PA	X04744	1196
GCCACAGAGG			1197
GGGGCAGCCC			1198
GGTGTTGCCG			1199
GGGTTGGCTT	tRNASer(UNC) [human, muscle, MERRF/MELAS overlap s	S79597	1200
GGGAAGAGTG			1201
GGGACCGTCA			1202
GCTGCAAAGG			1203
GAGGCCATCC			1204
TCGTAACGAG			1205
GTAGGGTTCC	H.sapiens BDP1 mRNA for protein-	X79568	1206

	tyrosine-phosphata		
AACTCAGCTA			1207
GGGGGCTCCT	Homo sapiens protein tyrosine phosphatase receptor	U71075	1208
GGGGGGCAGC			1209
GGGGTGAGCA			1210
TAGTTCCCAG			1211
TTTCTTAATG			1212
GGTCCAACTC			1213
TCACTTTCTT	Human TBP-associated factor TAFII80 mRNA, complete	U31659	1214
TCATTTTCCT			1215
GGGTAATGTG			1216
TACGGGGGCC			1217
TCCACTGGCC			1218
AAGAGCGCCG			1219
GGTATGGCAG			1220
TTGCGCTGGC			1221
TCTGTGACCT			1222
GGTACGTGGT			1223
TGACTGGTCA	Homo sapiens 59 protein mRNA, 3' end.	L19267	1224
TTGAAACTGT			1225
TTCTGGACCC	Human mRNA for proteasome subunit p40 / Mov34 prot	D50063	1226
TGCCAGGACA			1227
GGTACACTGC	Human tetracycline transporter-like protein mRNA,	L11669	1228
TGTAAGTCTG	Human p62 mRNA, complete cds.	M88108	1229
TGTGCTAATA	TSE1=protein kinase A regulatory subunit gene [hum	S54711	1230
GGGTAGGGGA			1231
TTGGTGATAC			1232
ACAGTGTGTG			1233
GGTGATAGGG			1234
GGTGACCACC	Human XIST, coding sequence 'd' mRNA (locus DXS399	X56196	1235
GGTGCTGGAG	Homo sapiens mRNA for putative methyltransferase.	AJ2244	1236
AGGACACCGC	Human mRNA for C-SRC-kinase.	X59932	1237
TAGACAATGC	Homo sapiens clone 23674 mRNA sequence.	AF0381	1238
GTCAGGCCTC			1239
GGGGCCCCAA			1240
GTGAGGGCAC			1241
AGAGCATATC	Human transducin beta-1 subunit	M36430	1242

	mRNA, 3' end.		
GTGCGGCTGG			1243
AGAACCTTCA			1244
CTACTGTTGG	Human mRNA for KIAA0312 gene, partial cds.	AB0023	1245
GTGTATCTTT	Human splicing factor SC35 mRNA, complete cds.	M90104	1246
GGGTTTGAAC			1247
GGTGACAGAG			1248
GGTCGACCTA			1249
GTTTGGAGCT	Human MAP kinase 3b mRNA, complete cds.	U66839	1250
TAACTAACAA	Human mRNA for KIAA0107 gene, complete cds.	D14663	1251
ACAGCGGCAA			1252
TAAGACTTTG	Homo sapiens casein kinase I gamma 2 mRNA, complet	U89896	1253
TACAATAATT			1254
TACATTGCTT	Human (clone E5.1) RNA-binding protein mRNA, compl	L37368	1255
TACCCTGGCA	Human beta-actin mRNA, partial cds.	M28424	1256
ACACTGCCCA	Homo sapiens amyloid beta-peptide binding protein	U96132	1257
AAGATAAACT	Human N33 mRNA, complete cds.	U42349	1258
TACGAAGTTC			1259
GTGGAGCGGA			1260
GTGGCCTGCA			1261
ATGCAGAGGT			1262
GTGGCAGTGG			1263
CGCGCGCTGG			1264
GTGGCATACA			1265
GTGGCATTTG			1266
GTGGCAAAGA			1267
GTGGCCCCCA			1268
GTGGAGTTTG			1269
GTGGCGGCAC			1270
GTGGCGGCTG			1271
GTGGCGGTCG			1272
GTGGCTGAGG			1273
GTGGCTTATG			1274
GGCCACTCTA	Human putative tRNA synthetase-like protein mRNA,	U07424	1275
CCCTCCTCTC	Human D3-type cyclin (CCND3) mRNA, complete cds.	M90814	1276
GTGCCTGCAT			1277
AGCAAGCCCC			1278

GGAGGGTGAG	Homo sapiens mRNA, complete cds, clone:RES4-23B.	AB0004	1279
GCTGCCCTGA			1280
GCTCTGAAGA	Human E2 ubiquitin conjugating enzyme UbcH5B (UBCH	U39317	1281
GTGCAGTTAG			1282
CTCAAAAAAA			1283
GTGCCCGTGC			1284
ATACAGCCAC			1285
GTGCGCTACT			1286
GTGCTCAGCC			1287
GAGAGGGCAG			1288
GAAGACGAAT			1289
GTGCTGGAGG			1290
CTGGCCGCTC			1291
GTGCCCACCA			1292
GTTAGCTGCA			1293
ATGGTTAAAG			1294
TTAAACCTCA	H.sapiens (TL35) mRNA from LNCaP cell line.	X75683	1295
GTGTAAAAAA	Human mRNA for transcriptional activator hSNF2a, c	D26155	1296
TCTTTCCAGA	H.sapiens hPTPA mRNA.	X73478	1297
GTGTCGCATC			1298
GTGGTGGTTA			1299
GTTAATTGCT			1300
GTGGTGGTGT			1301
GTTATATGCC			1302
GTTATGAAGC	Synthetic adenovirus transformed human retina cell	X78338	1303
GTTCATAGGT			1304
GTTCGTGCCC			1305
GTTCTGCCGC			1306
GTAAAACCCC	Human fibroblast mRNA fragment with Alu sequence (	X05128	1307
GTGTCTGGGA			1308
GTGGTACATA			1309
AGTGGCTGCC			1310
GTGGGAAACG			1311
GTGGGCACCT	Human mRNA for retinol binding protein (RBP).	X00129	1312
AGGGAGAGGG	Human isopeptidase T (ISOT) mRNA, complete cds.	U47927	1313
AGGGACATAA			1314
GTGGTGTACG			1315
GTGGGCCAGG	Homo sapiens gamma-glutamyl	M24087	1316

	transpeptidase mRNA, 3		
GGCGCCAAAA	Homo sapiens oriP binding protein (OBP-1) mRNA, 3'	L29095	1317
ACCCCTAACA			1318
ACCCACGTCA	Human jun-B mRNA for JUN-B protein.	X51345	1319
ACACAGTGTG			1320
GTGGTGACCC	H.sapiens mRNA for 52 kD subunit of transcription	Y07595	1321
AAAATTCTGG			1322
GTGGTGGCGT			1323
AGATTATATG	Human mRNA (KIAA00167), partial sequence.	D28589	1324
GTCACCCAAA			1325
AATGTCCGAA			1326
AGGTATGGAG			1327
AGGATGACCA			1328
GTATAAACGA			1329
AGCCACCACG	Homo sapiens mRNA for acetyl LDL receptor, complet	D86864	1330
ATAGCTGGGG	Homosapiens ERK activator kinase (MEK1) mRNA.	L11284	1331
GTCACAGTCC	Human serum response factor (SRF) mRNA, complete c	J03161	1332
ATCCCTCCCC			1333
ACTCAATAAA	Human clone JkR1 mRNA downregulated upon T-cell ac	U38441	1334
GTCCTGTCTG	Homo sapiens folate carrier mRNA, complete cds.	AF0043	1335
GTCGCTGAGA			1336
GTCGGGACAG			1337
ACCACAAATG			1338
GTGCAAATCC			1339
GGCTCCTGTG			1340
CCCGCATAGA	tumor suppressor gene, P16/MTS1/CDKN2=cell cycle n	S78535	1341
GTAATGAAGC			1342
CCTGAACTGG			1343
CCTAAACTCA			1344
GTACCAGCCA			1345
GTACTGTGGG			1346
ATACACTTTG			1347
CCCTGTTGAT	Human stratum corneum chymotryptic enzyme mRNA, co	L33404	1348
AATGTAATCA	Human sorcin (SRI) mRNA, complete cds.	L12387	1349
CCCAATAAAC			1350

CCAATGCAGC			1351
CACGCGGGCG			1352
CACCAGCATT			1353
CAACTGTATT	Human nuclear aconitase mRNA, encoding mitochondri	U80040	1354
GTAGGTGAGG			1355
CCCTTCTGCC			1356
TACATTCTGT	Human myeloid cell differentiation protein (MCL1)	L08246	1357
ACACTCTCCC			1358
TCAGCTGGCC			1359
TCAAGCCATC			1360
TAGTCTTAAC			1361
TAGAATTTTC			1362
GTGACTTTCT			1363
TACATTTTCA	H.sapiens mRNA for Sm protein G.	X85373	1364
GTGACCTCCC			1365
GTGAGACCCG			1366
GTGAGTCACG			1367
GTGATAGGAG			1368
GTAGAGCTTG			1369
GGTGTGGGTG			1370
GTGATTCCGC			1371
GTGAGAAGAG			1372
TTGGCCCAGA	Human IL-4-R mRNA for the interleukin 4 receptor.	X52425	1373
AATCCAAAGG	Human MAP kinase kinase 6 (MKK6) mRNA, complete cd	U39656	1374
GTCTAGTCAA	Human mRNA for KIAA0179 gene, partial cds.	D80001	1375
AACACAGCCT	ZA {region between exons 35 and 36 of the compleme	S81585	1376
AAAGTGCATC			1377
TTTTGTACTT			1378
TCCTAGCCTG			1379
TTTGCAATTA	Human mRNA for KIAA0193 gene, complete cds.	D83777	1380
CTAAGGCGAG			1381
TTGAGAGATG			1382
GTCTCAGTGC			1383
TTCATAGCTG			1384
GTGAACCCGT			1385
GTGAAGTCAG			1386
TGGCAACCTT			1387
TTTGCGTCAC			1388
GGGATTAAAG	Human MUC18 glycoprotein mRNA,	M28882	1389

	complete cds.		
GCTGTGCTGG			1390
GTCAACAGTA			1391
GTACTCCAGT			1392
GCCACTAAAT	Human mRNA for KIAA0377 gene, complete cds.	AB0023	1393
GCCCAGACAT			1394
GCCCAGGACC			1395
GCCAAAGGCC			1396
GGGCCCAGGG			1397
GCATTCCTCT			1398
GGGAGCCCGG			1399
GGCTGGGCTT			1400
GCCCCTCGAC			1401
GCCCGTCCCT			1402
GCCCGTTGCT			1403
GCGAGTACCA			1404
GCCCAGGGAA			1405
TAAGTAGCAA			1406
TCAGAAGTTC			1407
TCAAATGTCA			1408
GCAGAGCTGA			1409
TATACGCTCA			1410
TAGGGGAGGG			1411
GCAGCCATCG			1412
GTCATCACTG			1413
TAATATTTTT	Human HepG2 partial cDNA, clone hmd6b09m5.	D17110	1414
GCTGCGGTCC	Human HepG2 partial cDNA, clone hmd2h09m5.	D17015	1415
GCAGCGCCTG			1416
GTGGTGCGTG	Homo sapiens X-ray repair cross-complementing prot	AF0355	1417
GTGGCACCTG			1418
GCAGGAAATA			1419
GTGAACACAG			1420
GTCTACAATT			1421
TACAACAGCA	Human non-lens beta gamma-crystallin like protein	U83115	1422
GCGAGACCCC			1423
GCTTTGGGGT			1424
GAGCGGCTCT			1425
GCCTTCGGCG			1426
GACTTCTGAG			1427
GCCTTGATCT			1428
GCCTTGGGGG			1429

GAGTCTGTTC			1430
GCGAAACTCC			1431
GATCCCCAAC			1432
GCGAGCAGCG			1433
CTTCCGTAGC			1434
CTTAAGACTT			1435
CTGTGGTAGC			1436
GCGAGGCCCC			1437
GGCCTGCAGT			1438
GAATGCTGAC	Homo sapiens lysosomal pepstatin insensitive prote	AF0174	1439
GCCTACACGT			1440
GCCCTAATTG			1441
GCCCTCAGGG			1442
GCCCTGTAGT			1443
GCGCGGGCGA			1444
GCGAATTCCC			1445
GCCGACAAGG			1446
GCCTTCAAAA	H.sapiens mRNA for serine/threonine protein kinase	X97630	1447
GCCGGCTCTT			1448
GCACTTTGAG			1449
GCCCTGTAAT			1450
GCCTCTCTAC	Human mRNA for glutathione-insulin transhydrogenas	X07077	1451
GCCTGAGTGC			1452
GCCTGCCTGG			1453
GCCTGCTCAG			1454
GATGCGCTTG			1455
GCCGTGAGCA			1456
GAGGGGAGTT			1457
GCAGAGACAA			1458
AAGGAACTTG			1459
GAGCTCTGAG			1460
GAGCTTACCC			1461
AAGAGCCAAG			1462
AACTTTCTGG			1463
AAGTAGAGCA	Human ZP3 protein (ZP3) mRNA, complete cds.	M60504	1464
AACCGGGAAG			1465
GAGCAGCCCT			1466
AACCAGAATG			1467
GAGGGTGCGA			1468
AAAGAGTCGG			1469
AAAGAAACCC			1470
GAGTCGGCCC			1471

GAGTGAAATT			1472
GAGGCCGGAG			1473
GAGAGGGGGT			1474
ACCTTAATGG			1475
GAGAAAAAAA			1476
ACCTGAAGCG	Human mRNA for KIAA0323 gene, partial cds.	AB0023	1477
GAGAAGATCT			1478
GAGAAGTTGA			1479
GAGAATGGGA			1480
GAGCCTAGGA			1481
ACCCCAGGTT			1482
TTTGTTCATT	Homo sapiens HnRNP F protein mRNA, complete cds.	L28010	1483
ACCACAAATA			1484
GAGCACATTT			1485
AATTAACTCC			1486
GAGCACTGTT			1487
AAGTTGGTGC			1488
AAGTCATAGG	Human autocrine motility factor receptor mRNA.	M63175	1489
GAGAGCACCC			1490
TGAATGGCCT			1491
GATTGTAAGG			1492
GCAACTTGTC			1493
TGCTCTGTGT	H.sapiens mRNA for supt5h protein.	Y12790	1494
TGCCTTACTT			1495
GCAAGAAGAA			1496
TGCAATAAGC			1497
AAAAATAAAA	Human SnRNP core protein Sm D3 mRNA, complete cds.	U15009	1498
TGACCTTACC			1499
TGTATGGTGG			1500
GCACAGTGGG			1501
GCACCCCACC			1502
GCACCTCCAC			1503
TCTGAATCGG			1504
TCTCTGCTCA			1505
CTGGCAGATT			1506
TGAGTGGACA			1507
GATACTAGTG			1508
GCAGAAGCGT			1509
TTTGCGTCCG			1510
TTTGCGGTCC			1511
GAGTTCGACT			1512
TTTACAGCCC	Homo sapiens nuclear dual-specificity	U93181	1513

	phosphatase		
GATAAATTAA			1514
GATTGGCCTT			1515
TTCAGTGCCC			1516
TGTATAGCTT			1517
GATACTGAGG			1518
GATAGAACCA			1519
TGTTGTGCGC			1520
GATCCAGGCT			1521
GATCTCCGTG			1522
GATGCTTTCT			1523
GAGTGTTCAG	Human rho mRNA (clone 12).	X05026	1524
TTCTCTACAC	Human TSC-22 protein mRNA, complete cds.	U35048	1525
GTGATGGGCT			1526
GCTGCCCGGC			1527
TAGAAGATGC			1528
TAAACGTGGC			1529
TAAACATTGT			1530
GGATGAGTAC			1531
GTGTGTAAAA			1532
TATTGACAAC	Human X104 mRNA, complete cds.	L27476	1533
GGATTTTGGT	Human potassium channel mRNA, complete cds.	U33839	1534
GGATGAAACA			1535
GTCTTCTCTG	Homo sapiens membrane-associated kinase (Myt1) mRN	AF0141	1536
GGGGTGGGGC	Human CAD mRNA for multifunctional protein CAD, co	D78586	1537
GGCAACAAAA			1538
GGGGACGGCC			1539
GGATCAAGTC	Human damage-specific DNA binding protein p48 subu	U18300	1540
CTGTCAGCGG			1541
GGATGCAAGG	Human B lymphocyte serine/threonine protein kinase	U07349	1542
TGCCCAGGAT			1543
TGGTGTTGAA			1544
TGGGGCAAAG			1545
GGACCACCCA			1546
TGGCCCCCAC			1547
TGGCACTTCA	Human low-Mr GTP-binding protein Rab32 (RAB32) mRN	U71127	1548
TGGATTTCAC			1549
TATATTTTCT	Human transglutaminase mRNA, 3' untranslated regio	M98479	1550

TGCCTCTGTC	Human purine nucleoside phosphorylase (PNP) mRNA,	K02574	1551
GCTCCACTGG	Human cation-dependent mannose 6-phosphate-specifi	M16985	1552
GGAGCTGTGA			1553
TGAGGTGAAG			1554
GGAGGCATCA	H.sapiens (xs11) mRNA, 393bp.	Z36777	1555
GGAGTGGAAC			1556
GGATAAATGC	H.sapiens mRNA for nuclear pore complex protein hn	Z25535	1557
TCCTCTACCT			1558
GGACTTCTGT			1559
CCTGCCCCCC	Human extracellular signal-regulated kinase 1 mRNA	M84490	1560
GGCAACAAGA			1561
GGCCTGGCCT			1562
CTAACTCAGT			1563
CTAAAGACTT			1564
GGCTCAAAAC			1565
GGCTCCACAG			1566
GTTCTGTGTA			1567
CCTGGCTAAT			1568
CTTACGTGAT			1569
CCTGCAATCC			1570
CCTGAGGTCA			1571
CCTGAAATTT	Human heterogeneous ribonucleoprotein A0 mRNA, com	U23803	1572
CCGAGGCTTG	Human melanoma-associated antigen p97 (melanotrans	K03200	1573
GGCTCCCCAC			1574
CCCTACAACG			1575
CCTGTCCAGT			1576
GACCTCCTGC	Human protein kinase (MLK-3) mRNA, complete cds.	L32976	1577
GCCTGTGCTG	Homo sapiens Huntington's Disease (HD) mRNA, compl	L12392	1578
GGCAATGGAG			1579
GGCAGTGCCC			1580
GGCATTTTTC			1581
GGCCACAGAG			1582
GAGGTCACCA			1583
CTCTTCACGG	Human mRNA for alanyl-tRNA synthetase, complete cd	D32050	1584
GGCCACGTAG			1585
GGAACTTTTA			1586
GACCACGAAT	Human mRNA for cathepsin H (EC	X16832	1587

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GGCCCCCAAT			1588
GGCCCCTCCC			1589
GAAAAGGGTT			1590
CTTTCTTCCC	H.sapiens ERF-1 mRNA 3' end.	X79067	1591
CTTCTGTTTT			1592
GAGGCCAACA	Homo sapiens Pig3 (PIG3) mRNA, complete cds.	AF0103	1593
GCTAGACCCT			1594
TGTGACCTCT			1595
CCCAATACTC			1596
CCAAGGGCCC	Human mRNA for LZTR-1, complete cds.	D38496	1597
CATTTAGATT			1598
CAGTGATTCC			1599
CAGGTGCTGT	Human putative cyclin G1 interacting protein mRNA,	U61836	1600
GCGGGGCGAG			1601
CAGCTTCACC	Human nuclear RNA helicase, complete cds.	U90426	1602
GCGGGCAACT			1603
CACCTGTAGT	Human ribosomal protein L5 pseudogene mRNA, comple	U66589	1604
CACCCCTGAT	Human creatine kinase-B mRNA, complete cds.	M16364	1605
CAATTAAAGT			1606
GCTAGCCTCA			1607
GCTAGGAAAC			1608
GCTAGGTATT			1609
GCGTTTAATG			1610
CCTTGGTGCC	H.sapiens MLN62 mRNA.	X80200	1611
CTGCCCGCCT			1612
GCGCACCGCT			1613
CTCTCAATAT			1614
GCGCCTCAAC			1615
CTCATAAAAA			1616
CGTGAAAAAA			1617
CCCACGGTTA	H.sapiens mRNA for yeast methionyl-tRNA synthetase	X94754	1618
GCGCGATGCA			1619
ATGGCCATAG	H.sapiens mRNA for Ste20-like kinase.	X99325	1620
GCGGACACTC	Homo sapiens (clone S53) mRNA, 3' end of cds.	L40398	1621
CCTCGTCTTC			1622
GCGGCCCTAG			1623
CCCTTCGTCC			1624

GCGGCCGTGG			1625
GCGGCGCCGC			1626
CGTCTTCTCT	transcript ch4822 [human, RF1,RF48 stomach cancer	S77362	1627
GCTTCCGAGG			1628
GCTGTTGGTG	Homo sapiens partial mRNA for jagged2 protein.	Y14330	1629
GCTTATAAAA			1630
GCTTCACTCG			1631
GCTTCCACGA			1632
GCTTCCAGCT			1633
AACACATCAG	Human ataxin-2 (SCA2) mRNA, complete cds.	U70323	1634
GCTCACTGCG			1635
AAAGCATTTT			1636
GCTGACGGAA	Human mRNA for phosphoethanolamine cytidylyltransf	D84307	1637
GCTTGGTACT			1638
GGAAAAATTA			1639
TTTCTACTCA			1640
TTGGGGAAAC	Human biliverdin-IXalpha reductase mRNA, complete	U34877	1641
GGAAATTGTT			1642
GGCTCCCTGA			1643
AAAGGTGGAG			1644
AGGAAAGCCA	Homo sapiens mRNA for Rab9 effector p40, complete	Z97074	1645
TGTGGCACTG			1646
GCTCCATCTA			1647
ATCTTAGTCA	Homo sapiens mRNA for KIAA0521 protein, partial cd	AB0110	1648
GCTCCCGCCC			1649
ATCCCCCTGG			1650
AGTTTTACAA	Human HepG2 partial cDNA, clone hmd5c06m5.	D17081	1651
GCTGAGTGCA			1652
AGTAGTCTGC			1653
ACTGGTATAC	Human guanosine 5'-monophosphate synthase mRNA, co	U10860	1654
AGCTCACTCC	Homo sapiens Pig10 (PIG10) mRNA, complete cds.	AF0103	1655
AGCCTTCCTA			1656
AGATGAGATG	Human DNA-binding protein CPBP (CPBP) mRNA, partia	U44975	1657
GCTCTGGTGT	Human mRNA for KIAA0309 gene, partial cds.	AB0023	1658

GCTGACCCTG			1659
ACTTCTGCCC	Human mRNA for muscle phosphofructokinase (E.C. 2.	Y00698	1660
ATTCCAAGGA			1661
GCTCGGCCGC			1662
ACTGAGGAAA	insulin-like growth factor binding protein 3 {3' r	S56205	1663
TGGCCTAGGG			1664
TGTCTGTGGT			1665
TTCTCCCGCT	Human protective protein mRNA, complete cds.	M22960	1666
TTGTCGATGG			1667
TTAGCCCATC			1668
ATCCACATCG			1669
CAGCATCTAA			1670
TTAGCCAGGC	Human mRNA for tyrosine aminotransferase (TAT) (EC	X52520	1671
GGAGGTGGGG	Homo sapiens clone 24720 epithelin 1 and 2 mRNA, c	AF0550	1672
TTAGCATTTG			1673
GTGACAACAC	Human voltage-dependent anion channel isoform 1 (V	L06132	1674
TGGGTGGGGG			1675
TTAGATCGTT	Homo sapiens tetraspanin Tspan-6 (TSPAN-6) mRNA, c	AF0534	1676
CTTGTGAACT			1677
TGGCCTGCCC			1678
GTGAAACCTC			1679
TTAAAACATA			1680
CGGCTGAATT			1681
TTAAACATAA			1682
ATTATCCAGG			1683
ACGATTGATG			1684
AAGAAGACTT			1685
ACTCTGCCAA			1686
TGGCCATCTG			1687
CGCCTGTAAT	H.sapiens P1-Cdc21 mRNA.	X74794	1688
CCGTGGTCGT	Human fibrillarin (Hfib1) mRNA, complete cds.	M59849	1689
CAGGCTTCCA			1690
TTAACATAAG			1691
GCAACGGGCC	Human acyl-CoA thioester hydrolase mRNA, complete	U91316	1692
AAGGCCTTGT			1693
CGGCTGGTGA	Human mRNA for proteasome subunit HC5.	D00761	1694

TTCACAGCAG			1695
TTCGGACACT			1696
TTCTGAAGAC			1697
TTGAAAATGT			1698
GATGGGGACA	Human Dr1-associated corepressor (DRAP1) mRNA, com	U41843	1699
ACGTGGTGAT			1700
TTGAAGTCAA	Homo sapiens (clone cc33) S182 mRNA, complete cds.	L42110	1701
TTCGCTGTCG			1702
CCTTCCAAAT	Homo sapiens malate dehydrogenase precursor (MDH)	AF0474	1703
TCTGGTTTGT			1704
TCTGGTCTGG	Human surface antigen mRNA, complete cds.	M60922	1705
GCAAAACCCC	Homo sapiens tumor necrosis factor superfamily mem	AF0365	1706
TGAGGCCTCT			1707
TACCTACTGA			1708
GACTGCGCGT			1709
TTCAGGAGGG	Homo sapiens mRNA for T-cell receptor alpha, clone	Y16433	1710
TGTTTGTGTG			1711
GAGCCGCCTC			1712
GAGAGTGTCT	TIMP-1=metalloproteinase inhibitor [human, keratoc	S68252	1713
CAGGAGTTCA	Human BRCA2 region, mRNA sequence CG037.	U50523	1714
AGGGAAAGAG	edg-2=maternal transcript G10 homolog [human, umbi	S77329	1715
TTAGCTGAGT	Human cytochrome B561, HCYTO B561, mRNA, partial c	U06715	1716
TTCACTGCTA	Human lipoma cell line Li-14/SV40 ectopic sequence	U29116	1717
GGGCAGCTGG			1718
CAGGAGGAGT	Human mRNA for phospholipase C-alpha, complete cds	D16234	1719
CAGCTCATCT			1720
AAGTGATTCT	Human mRNA for ZFM1 protein, complete cds.	D26120	1721
TTCCATATAC			1722
TGCCCCCGGG			1723
TTCCCTGTCA			1724
GTGGACCCCA	Human siah binding protein 1 (SiahBP1) mRNA, parti	U51586	1725
TGGCGCCGAT			1726
TGGGCTGTGT			1727

TGGGCCAAAC			1728
TGATCTCCAA	fatty acid synthase {3' region} [human, breast and	S80437	1729
TGGGAGGGAG			1730
AGACAGAGTG			1731
ATCAAGTGGA	Human mRNA for KIAA0233 gene, complete cds.	D87071	1732
TGGGAGCCCT			1733
CTCGAGGAGG	Human ribosomal protein L23-related mRNA, complete	U26596	1734
CTGACACAGA			1735
TGGGACAGTT			1736
GCCTAGATAG			1737
TGGCTGTGAG	Human chromosome 17q12-21 mRNA, clone pOV-3, parti	U18920	1738
GGGAAGTCAC	Human FX protein mRNA, complete cds.	U58766	1739
CTTGATTCCC	Homo sapiens quiescin (Q6) mRNA, complete cds.	U97276	1740
TGGAGCGTCC			1741
TGGAAACTGA			1742
TGGAAATCAA			1743
TGGAAGAGCT			1744
TGGACCTGGA			1745
CCCCCAGATG			1746
TGGCGCTGGC			1747
AGCCTGCTCA	Human placental cDNA coding for 5'nucleotidase (EC	X55740	1748
GTGCTATTCT			1749
AAGGTAGCAG			1750
TGGAGGCCCA			1751
TTGAGCCAGC	Human FUSE binding protein 2 (FBP2) mRNA, partial	U69126	1752
TGAGGGGTGA	Human Gps1 (GPS1) mRNA, complete cds.	U20285	1753
TCCACGCACC			1754
TGGGTGCACA			1755
CCCAGGGAGA	Homo sapiens chaperonin containing t-complex polyp	AF0262	1756
TGTTACCTGT			1757
TAGGGCAATC			1758
TGTGGGTATT			1759
TGTGGGTCAC			1760
ACCCCCCCGC	Human junD mRNA.	X56681	1761
AAGTTTCCAA	H. sapiens mRNA for protein phosphatase X.	X70218	1762

TGTGCACACA			1763
TGTGGTGGCA			1764
TGTGAGGGAA			1765
TCTGTTTACT	Human methylenetetrahydrofolate dehydrogenase-	J04031	1766
TGTTAGCCTG			1767
GCGACAGCTC			1768
GCCAACCTCC			1769
TGTTTGCCAG			1770
GACTAAGAAA	Human hepatitis delta antigen interacting protein	U63825	1771
AAAACTGAGA	Homo sapiens CTG repeat mRNA.	L48984	1772
TGTCAATGGG			1773
GGGTTTTTAT	Human nuclease sensitive element binding protein-1	M85234	1774
TGGTGAACAG			1775
CTAATAAATG			1776
TGGTTTTGTA	Human mRNA for KIAA0175 gene, complete cds.	D79997	1777
ATGGCCAACT			1778
ATCAAGTTCG			1779
TGTAGAATTT	Homo sapiens unknown protein IT12 mRNA, partial cd	AF0409	1780
GTGGCGTGTG	Human clone 23933 mRNA sequence.	U79273	1781
TGTCCACCCT			1782
TGTCCCAGAG			1783
GGCCATCTCT			1784
GCGAAACCCT	c-erbB3=receptor tyrosine kinase {alternatively sp	S61953	1785
TGTCCTGACC			1786
TGTCCTTGAG	Homo sapiens KIAA0441 mRNA, complete cds.	AB0079	1787
TGTAAAAAAA			1788
TTTCCTTACA			1789
TACAAGAGGA	neoplasm-related C140 product [human, thyroid carc	S71022	1790
CTAGCCTCAC	Human mRNA for cytoskeletal gamma-actin.	X04098	1791
CGCCGACGAT	Human interferon-inducible mRNA fragment (cDNA 6-1	X02492	1792
ACTTTCCAAA			1793
GTACTGTGGC	Human nuclear chloride ion channel protein (NCC27)	U93205	1794
GTGCACTGAG	Human mRNA for HLA class-I (HLA-A26) heavy chain,	D32131	1795
GCAAGCCAAC			1796

TTTGGACAAT			1797
TCTGTACACC	Human mRNA for ribosomal protein S11.	X06617	1798
TTTGCAAAAA			1799
GTGACAGAAG	Human mRNA for eukaryotic initiation factor 4AI.	D13748	1800
TTTGATAATG			1801
CCTCGGAAAA	H.sapiens gene for ribosomal protein L38.	Z26876	1802
TTGTTGTTGA	Human mRNA for calmodulin, complete cds.	D45887	1803
TTTATTTTGA			1804
TTGACTCCTG			1805
TTTACAGAGG			1806
TTTATAACTT			1807
TGTGCTCGGG	Human mRNA for KIAA0088 gene, partial cds.	D42041	1808
GCCACACCCC			1809
GACGTGTGGG	Human histone (H2A.Z) mRNA, complete cds.	M37583	1810
AAGCCAGCCC	Human 80K-H protein (kinase C substrate) mRNA, com	J03075	1811
GCCTGCAGTC	Homo sapiens Kunitz-type protease inhibitor (kop)	AF0272	1812
GCTGAACGCG			1813
TTTCACAGGC			1814
TTTCACCAGT			1815
CACGCAATGC	Human homolog of Drosophila enhancer of split m9/m	U04241	1816
TTTCAGTGGG			1817
GGACTCTGGA	Human mRNA for zinc-alpha2-glycoprotein, complete	D90427	1818
CCTCAGCCCG	Human squamous cell carcinama of esophagus mRNA fo	D43772	1819
CACTCAATAA	Homo sapiens serine protease mRNA, complete cds.	AF0139	1820
TTTGTAATAT	Human grancalcin mRNA, complete cds.	M81637	1821
GCCGGGTGGG	Human collagenase stimulatory factor (EMMPRIN) mRN	L10240	1822
ACCCTTGGCC	Homo sapiens mRNA from HIV associated non-Hodgkin'	Y16704	1823
CCGTCCAAGG	Human ribosomal protein S16 mRNA, complete cds.	M60854	1824
TTTTGTAGAG	Human mRNA fragment for phosphoprotein p53.	X01405	1825
TTTTCTCTGA			1826

TTTTGTTTTT			1827
GACATCAAGT	Human mRNA for keratin 19.	Y00503	1828
GCTTTATTTG	Human mRNA fragment encoding cytoplasmic actin. (i	V00478	1829
GCGACCGTCA	Human fructose 1,6-diphosphate aldolaseA mRNA, 5'	M21190	1830
ACTAACACCC	Human PACAP type-3/VIP type-2 receptor mRNA, compl	U18810	1831
ATTTGAGAAG			1832
TTTTTACAGT			1833
GATCCCAACT	Human metallothionein II mRNA, partial cds.	M26637	1834
TTTTGTTAAT			1835
CCTGGAAGAG	Human thyroid hormone binding protein (p55) mRNA,	J02783	1836
GAGTTCGACC			1837
GCCTACCCGA	Human mRNA for pancreatic carcinoma marker GA733-1	X13425	1838
AGCAGGAGCA	Homo sapiens clone DT1P1A7 mRNA, CAG repeat region	U92985	1839
GAGAGCTCCC			1840
CTGTACAGAC			1841
TTTTCTCTGC	Human tyk2 mRNA for non-receptor protein tyrosine	X54637	1842
TTATGGGATC	Human MHC protein homologous to chicken B complex	M24194	1843
GCGGCGCTGC			1844
TTTGTCCTGG			1845
TTTGTTCGCA			1846
GTGCGCTGAG	Human mRNA for HLA class I locus C heavy chain.	X58536	1847
AACGACCTCG	Human mRNA fragment encoding beta-tubulin. (from c	V00599	1848
TTTTACTCAC	Human mRNA for erythrocyte adducin alpha subunit.	X58141	1849
TTCTTGTGGC			1850
AGGAAGGAAC	Human tyrosine kinase-type receptor (HER2) mRNA, c	M11730	1851
TTGCATTAAA			1852
GAAGCCAGCC	Human 4E-binding protein 1 mRNA, complete cds.	L36055	1853
TTGCTGTGTG			1854
TGCTTGTCCC	Homo sapiens clone 24614 ADP-ribosylation factor 1	AF0550	1855
CCCACACTAC	Human transducin beta-2 subunit mRNA, complete cds	M36429	1856
TAGCTGAGAC	Human nuclear localization sequence	U28386	1857

	receptor hSRP1		
CCACCCCGAA	H.sapiens TEGT gene.	X75861	1858
CGGCCCAACG	H.sapiens mRNA for arginine methyltransferase, spl	Y10805	1859
TTGCTCACAC			1860
TTGCCTTGTA			1861
ATCCGCGAGG			1862
TCAGATGGCG	Homo sapiens hD54+ins2 isoform (hD54) mRNA, comple	AF0044	1863
AAAGCACAAG	Human 56k cytoskeletal type II keratin mRNA.	J00269	1864
CCGGGCCCAG	Homo sapiens mRNA for TRIP6 (thyroid receptor inte	AJ0019	1865
GGCCCTGAGC	Human RNA polymerase II subunit (hsRPB10) mRNA, co	U37690	1866
TGCGCTGGCC			1867
GGCCAAAGGC	Human mRNA for KIAA0064 gene, complete cds.	D31764	1868
GAAACAAGAT	Human phosphoglycerate kinase (pgk) mRNA, exons 2	L00160	1869
TTGAGTGCAG			1870
GCCGCCCTGC	Human mRNA for very-long-chain acyl-CoA dehydrogen	D43682	1871
TTGATGATAA			1872
CTTGTAATCC			1873
AAAGCCAAGA	H.sapiens mRNA for electron transfer flavoprotein	X71129	1874
TTGCCTTGCT			1875
TCTTCTCCCT	Human mRNA for hepatoma-derived growth factor, com	D16431	1876
GTACGTCCCA	Human neutral amino acid transporter B mRNA, compl	U53347	1877
CGGATAACCA	Human cell cycle protein p38-2G4 homolog (hG4-1) m	U59435	1878
GTCTGAGCTC			1879
GGGACGAGAA			1880
GCCCAAGGAC	Human mRNA for actin-binding protein (filamin) (AB	X53416	1881
CCACCCCCAC	Human serum constituent protein (MSE55) mRNA, comp	M88338	1882
CAGCTCACTG	Homo sapiens mRNA for ribosomal protein L14, compl	D87735	1883
TTTTCTGAAA	Human thioredoxin (TXN) mRNA, complete cds.	J04026	1884
GGAGGGGGCT	Human mRNA for nuclear envelope protein lamin A pr	X03444	1885
GCCAGCCCAG	Human unknown protein mRNA, partial	U31657	1886

	cds.		
GAGGAGGGTG			1887
GTGGCACGTG	{Alu RNA transcript, clone NE461} [human, embryona	S42653	1888
CTGGATCTGG	Human fetal brain glycogen phosphorylase B mRNA, c	U47025	1889
TTCCACTAAC	Human plectin (PLEC1) mRNA, complete cds.	U53204	1890
TGCAGCACGA	Human MHC class I (HLA-Cw8.1) mRNA exons 1-7, comp	M84174	1891
TTGGTAATAT	Human dihydrofolate reductase gene.	J00140	1892
TTGTAACTGG			1893
TTGTTGGAGA	H.sapiens mRNA for polyadenylate binding protein I	Z48501	1894
AAGGACCTTT			1895
TTTAATACAT			1896
GCTAAGGAGA	Human ras-like protein mRNA, complete cds, clone T	M31467	1897
CTGCACTTAC	Human mRNA for P1cdc47, complete cds.	D55716	1898
TTGGATGAAG			1899
TGCTTTTAAC	Human mRNA for placental protein 5 (PP5), complete	D29992	1900
ACAACGTCCA	Human mRNA for KIAA0230 gene, partial cds.	D86983	1901
GTGGTGCACG			1902
GACGGCGCAG	Human platelet-derived endothelial cell growth fac	M63193	1903
TTGGAGCTGA			1904
GTCTGACCCC			1905
AGGATGACCC			1906
TGCTGGGTGG	Homo sapiens folylpolyglutamate synthetase mRNA, c	M98045	1907
TTGGCAACAT			1908
TGTGTGTTTG			1909
TTGGGCACTA			1910
GCCCCTCCGG	H.sapiens (xs99) mRNA, 344bp.	Z36851	1911
GAGCCTTGGT	protein phosphatase type 1 catalytic subunit [huma	S57501	1912
GGCTCCTGGC	H.sapiens mRNA for b4 integrin interactor.	Y11435	1913
GGTCCAGTGT	Homo sapiens phosphoglycerate mutase (PGAM-B) mRNA	J04173	1914
AGCCTTTGTT	Human mRNA for collagen binding protein 2, complet	D83174	1915
TATATTTTTA	H.sapiens mRNA for transforming growth factor alph	X70340	1916

TCTGTCCTCA	Human mRNA for LCA-homolog. LAR protein (leukocyte	Y00815	1917
TATATTTCCA			1918
TATATAGGTC			1919
TATAGTTGCT	Human mRNA for hCREM (cyclic AMP-responsive elemen	D14826	1920
TTGCTTTTGT	Human ADP-ribosylation factor 4 (ARF4) mRNA, compl	M36341	1921
TTGTAAAAGG			1922
TATAATTCAT			1923
AACAGTCAAA			1924
TATAAGGTGG	Human Gu protein mRNA, partial cds.	U41387	1925
AAGTGGGTGC	Homo sapiens mRNA for CIRP, complete cds.	D78134	1926
TATAAATAAT			1927
TAGGTCAGGA			1928
GAGAAACCCT			1929
CCCTGCTCCT			1930
GGAGCCCAGG			1931
CTCCCGGCGA			1932
CTCATCAGCT	Homo sapiens adenylyl cyclase-associated protein (	L12168	1933
CTATGGCTTC			1934
CTACCCGGTA	Homo sapiens G protein-coupled receptor Edg-4 mRNA	AF0114	1935
ACTACAGCAC			1936
TAGGAAACAC			1937
AGAAGGCTGC	protein kinase PRK1 [human, fetal brain, mRNA, 300	S75546	1938
TAGGTAGCTC	Homo sapiens spliced UHG RNA.	L36587	1939
CCCCCTGCCC			1940
CAAGTGGCAA			1941
ATACTTTAAT	Human placenta anticoagulant protein PP4 mRNA, com	M19384	1942
AGTTTCTTGT			1943
GTTGGATAGG			1944
CCTGTGATCC			1945
TCACCTGTAG	H.sapiens mRNA for kinase A anchor protein.	X97335	1946
TATGCTGTTA			1947
TCAAATGCAA	Human mRNA for KIAA0156 gene, complete cds.	D63879	1948
TCAACAGCCA			1949
TCACAAAGTG			1950
TCACAAGCCA			1951
CCGATCACCG	Human translational initiation factor 2	M29536	1952

	beta subun		
ATATAGGTCG			1953
TCAAAAACTT	Human cell cycle control gene CDC2.	Y00272	1954
TCACCTTAGG			1955
TCACTCCTGG			1956
TCAGAGGTGG			1957
ACAAATCCTT	Human FK506-binding protein (FKBP) mRNA, complete	M34539	1958
AAATAAAAGC	thyrotropin receptor {3' region} [human, mRNA Part	S82807	1959
TCAGGAGACG			1960
TCACCAAAAC			1961
TATTTCCCTG			1962
TAGCCTCACT			1963
TATGGCCAGT			1964
TATGTATTTC			1965
GGCGGCTGCA	Homo sapiens excision repair protein (ERCC1) mRNA,	AF0019	1966
GGCCTGCAGG			1967
CATAGAGCCA			1968
TATTTACTCT			1969
TATGCTTAGT			1970
GCACCTAGTG	Human acid finger protein mRNA, complete cds.	U09825	1971
GCAACTTAGA			1972
TATTTGCTAC			1973
CTGGAGGCAC			1974
CTCTGTGTGG	Homo sapiens EB1 mRNA, complete cds.	U24166	1975
TATTTTCTTC			1976
TATTGAAAGT			1977
CTTAAGGATT			1978
TAATGTGAGG			1979
ATTTCCTTGA			1980
CACTCGTGTG			1981
TAATATGAGC			1982
CATTGCAGGA			1983
TAAGGCTTTT			1984
CCCAGGACAC			1985
TAAGCTCTCT			1986
TAAGCCTCCT			1987
TAAATTAAAA			1988
TAAATATGAC	Homo sapiens mRNA for zinc finger protein FPM315,	D88827	1989
TAAATAGGCA	Human mRNA for thrombospondin.	X04665	1990
TAAATAAATA	Human mRNA for amyloid A4 precursor	Y00264	1991

	of Alzheimer's		
GACCGAGGTG			1992
GCCCCAGCGA			1993
GTTGAAATAA			1994
GTTGATTTTA			1995
GTTGCTGGGG			1996
GGAGTGGGCT			1997
GTTGTTAACA	Homo sapiens heparan sulfate 3-O-sulfotransferase-	AF0193	1998
TAAAGGCCAA			1999
GCGATTCCGG			2000
CTGGTCCTCC			2001
GTTTGATAAA	Human hypothetical protein A4 mRNA, complete cds.	U81556	2002
GCAACCACGA			2003
TAAAATCTTC	Human mRNA for calpastatin, complete cds.	D16217	2004
TAAAATGTGT			2005
TAAAGCACTT			2006
TACAGTTCAG			2007
GTTTCAGGAA			2008
TAGACCAGAT	Homo sapiens mRNA for KIAA0515 protein, partial cd	AB0110	2009
TACAGGGGTC			2010
GTTGGGAGTC			2011
GTGACAGACA	Human nuclear factor NF45 mRNA, complete cds.	U10323	2012
GTGAAGCTGA			2013
GTGAAACCCG			2014
TAACCCAACA	Human phosphoglucomutase 1 (PGM1) mRNA, complete c	M83088	2015
TAGAAATGTT			2016
TACTGCCTCT	Homo sapiens centrosomal Nek2-associated protein 1	AF0491	2017
GCGAAGGTGG			2018
GCCGGCCGGA			2019
GCCGATCCTC			2020
GCCGACTCCG			2021
TAGATTCAAC			2022
GAGGAAGAAG	tumor rejection antigen/endoplasmic reticular heat	S74942	2023
GTATTGGCCT			2024
TACCTTCATT			2025
TTCACCAGGG	H.sapiens mRNA for alpha-centractin.	X82206	2026
AATTTCTATT			2027
AAAGTTCGTA			2028

GACTCTGCCT			2029
TTAGATAAGC	Human chaperonin protein (Tcp20) gene complete cds	L27706	2030
TAACAGAAAG	Human DNA-binding protein (NF-E1) mRNA, complete c	M76541	2031
TGTTGATTTT	Homo sapiens agrin precursor mRNA, partial cds.	AF0169	2032
ACTCCCTCCT			2033
TGGAAGAAAC			2034
TGAACCCGCC			2035
TCTGTTTATC	Human 18 kDa Alu RNA binding protein mRNA, complet	U07857	2036
TACTCTGCCC			2037
TCAGGCTGTT	H.sapiens mRNA for beta-centractin (PC3).	X82207	2038
TATTCCCCAC			2039
GAAGAACAAG			2040
TCCTCGGGCA			2041
AGCCCGCCGC	Homo sapiens tumor-suppressing subchromosomal tran	AF0199	2042
ATTGGACACA	H.sapiens mRNA for nucleoside-diphosphate kinase.	Y07604	2043
CAGTGGGTGT			2044
CCAGGCTGCG	Human integrin beta-5 subunit mRNA, complete cds.	J05633	2045
TGCAGTGACT	H.sapiens mRNA for 37 kDa LIM domain protein.	X93510	2046
CTTTCCCCTT			2047
GAGGATGGTG	Human mRNA for C3G protein, complete cds.	D21239	2048
GATTCAAGTC	Homo sapiens mRNA for mitochondrial ribosomal prot	Y11681	2049
TGATTTTCAC			2050
GCCCCCCCGT			2051
GGAACGGATG			2052
GGATTGTCTG	Human small nuclear ribonucleoprotein particle SmB	M34081	2053
TGATTTCGCT			2054
TCAGGGCTGA			2055
AACCCAAACT			2056
ATCACAGGCC			2057
TGAAGTTATA	Human mRNA for fibronectin receptor beta subunit.	X07979	2058
ACCCACAGTG			2059
ACCAAGGAGG	Human RNA polymerase II 23kD subunit (POLR2) mRNA,	J04965	2060
TGAATTCTAC			2061

GTGTTCTTGG	Homo sapiens phosphatidic acid phosphatase type 2	AF0560	2062
AAGCGGGACC	H.sapiens TE2 mRNA for ARD-1 N-acetyltransferase h	X77588	2063
TAAGAAAAGG			2064
TGAGGAGCTC			2065
TGGTCTGGAG	Human mRNA for KIAA0216 gene, complete cds.	D86970	2066
TGAGTGGTAG	Human mRNA for nuclear envelope protein lamin C pr	X03445	2067
TGATCCTTGT			2068
TGATGGCTCC	Homo sapiens arylsulphatase A mRNA, complete cds.	X52151	2069
TGCCAGGACT	Human nucleotide-binding protein mRNA, complete cd	U01833	2070
TGAGCACTCG			2071
AAAATATTTT	Human mRNA for alpha-actinin, partial cds.	X55187	2072
ACTACCTTCA	Homo sapiens px19 protein pseudogene mRNA, partial	U94779	2073
CAGCCCAACC	Homo sapiens eukaryotic translation initiation fac	AF0208	2074
TGCTGTGAAA			2075
TGCTGTGACC			2076
ACCGCTTGTT	Human type 3 inositol 1,4,5-trisphosphate receptor	U01062	2077
CAGTTGGTTG	Human RNA fragment from patients with Crohn's dise	U55217	2078
AAGCCCAGGC			2079
TGCTGGAATT			2080
TTTTCTGCTG			2081
TGCTTGTGGT			2082
TTCACTGCCG	Human fetus brain mRNA for vacuolar ATPase, comple	D49400	2083
TGCTTTCTTA			2084
TGCTTTGCTT	Human mRNA for KIAA0207 gene, complete cds.	D86962	2085
GGGCCCAGGA			2086
AAGGAATCGG			2087
TGCCTGGAAA	Homo sapiens APECED mRNA for AIRE-3, complete cds.	AB0066	2088
TGAAGACAAC			2089
TTTCCACTTA	Human SIP-1 mRNA, complete cds.	U82108	2090
TTGCCGGTTA			2091
TGCTGCCCTG	Human mRNA for B-myb gene.	X13293	2092
TAGAAAAATA	Human transactivator protein (CREB) mRNA, complete	M27691	2093

CAGCTGTAGT	Human mRNA for KIAA0174 gene, complete cds.	D79996	2094
GTCTCCTAAT			2095
TGCATCAGAA			2096
GGGTGTGTAT	Homo sapiens angio-associated migratory cell prote	M95627	2097
TGCCTTTAAC			2098
GCCGCCATCA	Human mRNA for protein disulfide isomerase-related	D49489	2099
GCCAGACACC			2100
TGCGCGCCCT			2101
TGCTGCTGCT	Homo sapiens GT219 mRNA.	L38936	2102
GTTCAGCTGT	Homo sapiens porin (por) mRNA, complete cds and tr	L08666	2103
CAGCGCTTTG			2104
TCTACAGCTG	Human FE65-like protein (hFE65L) mRNA, partial cds	U62325	2105
TCCTCAACCT			2106
TCCTCTGTGC			2107
TCCTGGGGCA			2108
CGGAGTCCAT	Human mRNA for Diff6, H5, CDC10 homologue, complet	D28540	2109
TCCGTGTATA			2110
CCCCAGTCGG	Human protein tyrosine kinase mRNA, complete cds.	M59371	2111
TCCGTATTAA			2112
ATGTGCGTGG	Human SNC19 mRNA sequence.	U20428	2113
TCGCCAGCCC	Homo sapiens DGS-I mRNA, 3' end.	L77566	2114
TCGGCTTTAT			2115
TCGGGCCGCG			2116
ACCACACCCT	Human fra-1 mRNA.	X16707	2117
ATGTACCTGA	Human XMP mRNA, complete cds.	U52100	2118
TCGAAAGCCC			2119
TCCAGAACGC			2120
GGGCCTGGGG			2121
TTAATAAAAG			2122
TGTTACTGCT	Human HepG2 3' region cDNA, clone hmd3h09.	D16927	2123
TCATCAGGAC			2124
TCATTTCAGA	Human erythroblastosis virus oncogene homolog 2 (e	J04102	2125
TCCTAATCCC			2126
TCCACGTACA			2127
AACAGAAGCA			2128
TCCAGAGAAG			2129
TCCATTTTCT			2130

TCCCACCCAC			2131
GGGCTGCGTC			2132
TCCCGTAATC			2133
GGAGGTAGGG	Human transmembrane receptor precursor (PTK7) mRNA	U40271	2134
TCCAAACCAC			2135
TCTTTCCCTT			2136
TCGTTATGCA			2137
TCTCTTTCCC			2138
GGACTGGCCC			2139
TCTGATATGG			2140
TCTGCAAGAA			2141
GGGGTCTGGG			2142
TCTTCCCTCA			2143
GTAGCGCACG			2144
TCTTTCTACC			2145
TCTTTGTCAT			2146
TGAAAGAAGT			2147
CATCTAAACT	Human mRNA for KIAA0038 gene, partial cds.	D26068	2148
CAGGATCCAG	Human progesterone receptor-associated p48 protein	U28918	2149
TCAGTTATCT			2150
GACCCACTAC	Human lymphocyte activation antigen 4F2 large subu	J03569	2151
TCTCCTTCAT			2152
TCTATTGGTG			2153
TCTCCAAGGA			2154
TTCTTCTCGT	H.sapiens mRNA for SMT3A protein.	X99584	2155
TGTTTGGGGG			2156
TCTCCATCAC			2157
GGGCAGGCGT	Human transcription factor ETR101 mRNA, complete c	M62831	2158
TGAGTCCCTG	Homo sapiens Pig12 (PIG12) mRNA, complete cds.	AF0103	2159
CACCGGACAC			2160
TCCAGCCCCT			2161
TCATAGAAAC	Human mRNA for KIAA0098 gene, partial cds.	D43950	2162
TATTTATTCC	Human mRNA for Src-like adapter protein, complete	D89077	2163
TAAAGTGTCT			2164
GTGGTGGGTG	Human RACH1 (RACH1) mRNA, complete cds.	U35735	2165
TCTCTTGACA			2166
TGCGTTTGCT			2167

AGGAACCAGA	Human phosphatase 2A inhibitor I2PP2A mRNA, comple	U51924	2168
TCTGTGACTT			2169
AGCAATTTCA			2170
AGCACAGAGG			2171
AGCAGAGGCT	Human epidermoid carcinoma mRNA for ubiquitin-conj	D83004	2172
AGCAGCCTTT	Human mRNA for p97 homologous protein, partial cds	D86549	2173
AGCCACTGTA			2174
TCTGGGAGAA			2175
AGCCCCTACA			2176
TCTGGACTCG	Homo sapiens mRNA for putative ABC transporter, pa	AJ0050	2177
AGCCGCAAAC	Human mRNA for proteasome subunit p27, complete cd	AB0031	2178
AGCCGGGCTT			2179
AGCCTGACTG	H.sapiens mRNA for 2.19 gene.	X87193	2180
AGCCTGGAGA			2181
TCGGAGCTGT			2182
AGGCAGGAGG			2183
TGACTGGCCA			2184
AGGCTGCGAC			2185
TCTAAGCCCC			2186
AGGCTATTGG			2187
AGGCGCTTAG			2188
AGCCTGTGCT	Human mRNA for leukotriene b4 receptor, complete c	D89079	2189
TCTATCTCAG			2190
AGCTCTGGAA			2191
AGGCAACTGG			2192
AGGATAACTT			2193
AGGAGGGTGG	Human lamin B mRNA, complete cds.	M34458	2194
TCTCTGCCTC			2195
AGGAGAGAAG			2196
TCTTTTATTA			2197
AGGCCCCAGG			2198
ACCCGCGAGG			2199
TCTTCAGTAG			2200
ACCTGGCCTG			2201
TGAAGTCACT			2202
ACCTACGATG	Human phorbolin I mRNA, partial cds.	U03891	2203
TGAATGTGGA			2204
ACGTAATTAG			2205
ACCCTCCTGT			2206
ACGTCGTCGA			2207

ACCCGCCTGT			2208
ACCCAGTTGT			2209
ACCCAATCAG			2210
ACCATTGTGT			2211
ACCAGGTCCA			2212
CAGCCCCGCC			2213
TGACCACCTA			2214
ACTGTGGTAG			2215
AGGTCAGGAA			2216
AGACACCTGT			2217
TGAAAGTAAA			2218
AGAACCTTAA			2219
AGAAAATGTG			2220
ACGGAAGTTT			2221
ACTTACCTGT			2222
AGAGCTCCAT			2223
ACTGGTGGTC			2224
ACTGCTGTCT			2225
ACTGCCACAG			2226
ACTGAGGAAC			2227
ACTCAGCCCC			2228
ACTATTCCAT			2229
ACTTGCGAAT			2230
CACCTAAATG			2231
ATTTATCCTA			2232
TCCCTCTCAG			2233
ATTTCCCACC			2234
ATTTCCTCTT			2235
ATTTCTCATT			2236
ATTTTTTACA			2237
CAAACTGCTT	Human cAMP-dependent protein kinase regulatory sub	M18468	2238
TCCATTAAGC			2239
CAAAGGCCCT			2240
TCCAGTTCTG			2241
TCCAGGCTCT			2242
TCCACCTGTC			2243
CAATTACCTG			2244
AGGCTGGGGG			2245
CACTGCAAGG			2246
AAAGAAAGCC			2247
CAGCAAAAAA	pyruvate carboxylase [human, kidney, mRNA, 4017 nt	S72370	2248
CAGATATATA	Human cDNA for uracil-DNA glycosylase.	X15653	2249
CAGAGCCTGC			2250

CAGAGACCAA			2251
CACAGGCCTG	Human zinc finger protein zfp2 (zf2) mRNA, partial	U71598	2252
TCACCATAGA			2253
TCAGACGCCA			2254
CACTCCAATA			2255
CACTCACACC	Human SR31747 binding protein 1 mRNA, complete cds	U79528	2256
CACGACTGTT			2257
TCACTCTTTG			2258
CACCTCATCC			2259
TCCCTGAGCA	Human mRNA for KIAA0056 gene, partial cds.	D29954	2260
CACTGGAAGG			2261
AGTTTGAGGC	Homo sapiens hCAP1b mRNA for mRNA capping enzyme,	AB0121	2262
ATTTAGGCAA			2263
TCGATATTTG			2264
ATCCTGTAGG			2265
TCGCCCAGGC			2266
TCGCGCAATA			2267
ATGAACAGCG	Human transcription factor RTEF-1 (RTEF1) mRNA, co	U63824	2268
ATATAAAAAT			2269
TCCTTTTCCT			2270
AGTTAGCAGT			2271
AGTGTGATAC			2272
AGTGGCTGTG			2273
AGTGGAGGTG			2274
AGTAATCATC	Human mRNA for proteasome inhibitor hPI31 subunit,	D88378	2275
AGGTGGTTAG			2276
ATATGGGGTG			2277
ATGGTGAGCG			2278
ACACTTACAA	Homo sapiens UEV1Bs (UBE2V) mRNA, alternatively sp	U97280	2279
ATTGTAAACT			2280
ATTGCCCGTG			2281
TCCGCGTACA			2282
ATGTTTAATT			2283
ATGAAACTTC			2284
ATGGTGGGTG			2285
ATTGTGCTTG			2286
ATGGCTGCTG			2287
TCCTTATTAA			2288
ATGGCACCAC	Human mRNA for interleukin-2	X01057	2289

	receptor.		
TCCTTGAATA			2290
ATGCTTTTAT			2291
ATGACTGCTG			2292
TCCTGCATTT			2293
TTCCCCCTTC			2294
TTGTATTCCA	H.sapiens mRNA for alpha 4 protein.	Y08915	2295
TTGGTGCTTG			2296
TTGGGGTTTA			2297
TTGGGCCAGG			2298
TTGGCTGTCT			2299
TTGGCCAGGT			2300
TTGGCCAGGG			2301
TTGGCAAGCG			2302
TTGCACAACC	Human EST clone NIB1543 mariner transposon Hsmar1	U80776	2303
TTGAGGGGGT			2304
TTCTTTTGCT			2305
TTCCTAGCAA			2306
TTCCCTGCAA	Human precerebellin and cerebellin mRNA, complete	M58583	2307
TGTTCGGTTG			2308
TTAAGAAGCC			2309
ACATCAAAAT	Homo sapiens spermidine aminopropyltransferase mRN	AD0015	2310
TGTTTCCCAA	Human mRNA for KIAA0011 gene, complete cds.	D13636	2311
TGTTTGGAAC	Human TNF-alpha converting enzyme mRNA, complete c	U86755	2312
TTTTTTTAAA			2313
TGTTTTCAGG			2314
TTCCCCTTCC			2315
TGTTTTGAAT			2316
TTCCCCGTAC			2317
TTACAATTTA			2318
TTACAGTCTT			2319
TTACTGGGTT			2320
TTCCAGACTT			2321
TTCCAGGTTT			2322
TTGTTCTTTG	Human phosphatase 2A mRNA, complete cds.	J03804	2323
CTAAGACTTC			2324
AAAAAAAAGA			2325
TTGTCCTCAG			2326
TTTTCGGCAA	Homo sapiens proline-rich Gla protein 2 (PRGP2) mR	AF0092	2327

TTTTCTTCAC	Human cytosolic serine hydroxymethyltransferase (S	L11931	2328
TTTTGTAATT	Human mRNA for KIAA0091 gene, complete cds.	D42053	2329
TTTTGTATAT			2330
TTTTATTAAA			2331
AAAAAAAAAG			2332
TTTTATGACC	Homo sapiens clone 23689 mRNA, complete cds.	AF0352	2333
AAAACATCTC			2334
AAAAGCAGGA			2335
AAAATAAAAA	Human mRNA for protoporphyrinogen oxidase, complet	D38537	2336
AAACAGAGCT			2337
AAACATTACC			2338
ATTTTATATC	Homo sapiens (clone S31i125) mRNA, 3' end of cds.	L40397	2339
TTTTGTTTTG			2340
TTTCTGGAGG	Homo sapiens mRNA for KIAA0545 protein, partial cd	AB0111	2341
TGTGGCCTGC	Human glucose-6-phosphate dehydrogenase (G6PD) mRN	M35604	2342
TTTAATTTGT			2343
TTTATTTAAG	Human mRNA for HHR23A protein, complete cds.	D21235	2344
TTTCACCCCT			2345
TTTCCAGGGG			2346
TTTTCAAGAA			2347
TTTCTCGTCG	Homo sapiens guanine nucleotide binding protein al	AF0114	2348
TTGTCCTTTT			2349
TTTGAGCTGG			2350
TTTGATAAAT			2351
TTTGCACTTG	H.sapiens Wee1 hu gene.	X62048	2352
TTTGGAATGT			2353
TTTGTTAATT	Human hnRNP H mRNA, complete cds.	L22009	2354
TTTGTTGTTG			2355
TTTCCTTGTG			2356
AAGTTCTGCG	Human replication protein A 32-kDa subunit mRNA, c	J05249	2357
AAGACATTCT			2358
AAGAGACACA			2359
AAGATGAGGG			2360
TGCACGCACA			2361
AAGCAGGAGG	Homo sapiens mad protein homolog	U68019	2362

	(hMAD-3) mRNA, co		
AAGCCAGGGG			2363
AAGCTGTTGT	H.sapiens mRNA for DNA (cytosin-5)-methyltransfera	X63692	2364
TGATTCATTT			2365
TGATGTTTGC			2366
AAGGATTCAC			2367
AAGGCAGAAG			2368
AAGGTGGAAG			2369
TGATGAGTGC			2370
TGTTCTTTAG	H.sapiens mRNA for protein-tyrosine-phosphatase (t	X93920	2371
AATGGAGACT	Human mRNA for 19kD protein of signal recognition	X12791	2372
ACACAGTTTT	Human HepG2 3' region MboI cDNA, clone hmd3e02m3.	D17205	2373
ACAAGCATTT	Human CDK4-inhibitor (p16-INK4) mRNA, complete cds	L27211	2374
ACAAAGGGCC	Homo sapiens KIAA0397 mRNA, complete cds.	AB0078	2375
TGAGATTTCT			2376
AATTTGAGAA			2377
AAGTCCCAGG			2378
AATTAATTGT			2379
TGATGACTGT			2380
AATGAACAAT	Human ninjurin1 mRNA, complete cds.	U72661	2381
TGAGCGTGGG			2382
AATATTTCAA	Homo sapiens cytoplasmic phosphotyrosyl protein ph	M83654	2383
TGAGTCTGGC			2384
TGATCTGTTG			2385
AACCCGGGAA			2386
AATTCTGTAA			2387
TGGTCCAGCG	Human CD14 mRNA for myelid cell-specific leucine-r	X13334	2388
AAGAAGGGAG			2389
TGGATCATCA			2390
TGGATCCCAG	Human TFIID subunit p22 mRNA, complete cds.	D50544	2391
TGGATCCTAG			2392
TGGCAATGGC			2393
TGGAACCTTG			2394
TGGTAGAGCG			2395
TGCTAACTGC			2396
TGGTCCCTCT	H.sapiens sds22-like mRNA.	Z50749	2397
TGTAAAATGG			2398

TGTCACACAC			2399
TGTCCTCCCC			2400
TGTCTTAAGG			2401
TGTGCTGTGC	Human UDP glucose:glycogen 4-alpha-D-glycosytransf	U32573	2402
TGGCTGTGAC	Human mRNA for KIAA0110 gene, complete cds.	D14811	2403
AAACCAGAGG	Human lymphoid-restricted membrane protein (Jaw1)	U10485	2404
CAGCTTGACG			2405
TGCCAAAAAA			2406
TGCCCACTCA			2407
TGCCTCCCAT	Human eukaryotic initiation factor 2B-epsilon mRNA	U23028	2408
AAAGGAAAGT			2409
TGGAGACTGG	Homo sapiens mRNA for Dnm1p/Vps1p-like protein, co	AB0069	2410
AAACCTCTCA			2411
TGCAGGTGGC			2412
AAACATTCTC			2413
AAAATTATTA			2414
TGCCTGTGGT			2415
AAAACAAAAA			2416
AAAAATGTGT			2417
TGCGGCTGGT	H.sapiens mRNA for dynactin.	X98801	2418
AAACTGTGAA			2419
GCCCTGACCT			2420
GTGGCTGAGC			2421
GCAGTTCAAG			2422
GCATTTGGTA			2423
GCCAAGACAC			2424
GTGGAGGGGC	Human protein-tyrosine phosphatase mRNA, complete	U27193	2425
GCCAATGTGG	Homo sapiens mRNA for putative glucose 6-phosphate	Y15409	2426
GCCAGCTCAG			2427
GCCAGGGCGC			2428
GCCAGTGGCC			2429
GCCCCCTTCC			2430
GTGCTCAAAC	Human mRNA for KIAA0346 gene, partial cds.	AB0023	2431
GCCCGCAGTG			2432
GTGCAGGCTC	Homo sapiens peptide transporter (TAP1) mRNA, comp	L21208	2433
GTGACTGGCA			2434
GCCTCAGGGA			2435

GAGAAACCCA			2436
GTGATATCCA			2437
GCGAACCGTC			2438
GCGAAAAGCT			2439
GTGATGCTGG			2440
GCCCGTGTCC			2441
GCCTGATTTT	Human kidney mRNA for putative membrane protein wi	D82060	2442
GCCCTCACAG	Human fragile X mental retardation syndrome relate	U31501	2443
GTGATTTGTT			2444
GCCGGTTGGG			2445
GCCGCCTGTG			2446
GCCGCCTGCC	Human IMP dehydrogenase type 1 mRNA complete cds.	J05272	2447
GTGCAGAGAG			2448
GCACTTCAAG			2449
GCCTTGGGTG	Human mRNA for leukaemia inhibitory factor (LIF/HI	X13967	2450
GTTTAGTCTC			2451
GCAGCCCGCG			2452
GTTCCAAGCA			2453
GAGTCTTCTG			2454
GTTCTGGGCG			2455
GAGGTTCTTC	Human hydroxymethylglutaryl-CoA lyase mRNA, comple	L07033	2456
GATAATTTTT			2457
GTTGGTGGCA			2458
GATCTCACTG			2459
GAGGAACCAG			2460
GAGCTGCAGG			2461
GAGCGCAGCG	Human cleavage and polyadenylation specificity fac	U37012	2462
GAGCCAACCC			2463
GAGACCCTGG	Homo sapiens clone 24666 sec6 homolog mRNA, partia	AF0550	2464
CAGCAGCGGC			2465
GAGGGTCTTG			2466
GCAACAAATC			2467
GCGGAAACTG			2468
GTGGGGAGGA			2469
GTGGGGCTAT			2470
GTGGGTCAGC			2471
GCACACTAGC			2472
GAGTTAGGCA	Homo sapiens clone 1400 unknown protein mRNA, part	AF0207	2473

GCAACTTGGA	Homo sapiens SH3-containing adaptor molecule-1 mRN	AF0372	2474
GTGGCTGCTG			2475
GCAAAACTCT			2476
GATGTGTGCT			2477
GATGTGGAGA			2478
GATGTAGTAT			2479
GTGTTCCTCC			2480
GATGCATATA			2481
GCAAGGCAGA			2482
GGTATGACAT	Human fatty acid amide hydrolase mRNA, complete cd	U82535	2483
GTATCTTCAA			2484
GTAGGGGCCT			2485
GGATGAGTCT	Human anti-c-erbB-2 immunoglobulin light chain V m	U38346	2486
GGCAGCCTGG	Human ERPROT 213-21 mRNA, complete cds.	U94836	2487
GGCAGGCACC			2488
GGCAGGCTGT	Homo sapiens cyclophilin-33A (CYP-33) mRNA, comple	AF0423	2489
GGCATAATAG			2490
GTAGCAGGGC			2491
GGCATTGTTC	H.sapiens mRNA for RNA polymerase II subunit hRPB1	Z49199	2492
GTACATCCTT	Human arfaptin 2, putative target protein of ADP-r	U52522	2493
GGTTGAGTGT			2494
GGCCTTCCTT			2495
GGTGAAAGAG			2496
GCGACAGTCC			2497
GGGACAGGCA			2498
GGGGGGGTCT	Homo sapiens protein phosphatase 2A B56-gamma1 (PP	L42375	2499
GGGCGGGTCC	Human sky mRNA for Sky, complete cds.	D17517	2500
GGGGGTGGAT	H.sapiens mRNA for FAST kinase.	X86779	2501
GGGCCTTTTC			2502
GGGCAGGGGC			2503
GGTCTGTCTC			2504
GGGAGACCCC			2505
GGTCAGGGTG			2506
GGGAAGATGA	Human heat shock protein 27 (HSP27) mRNA, complete	U15590	2507
GGGTGGGGGC			2508
GGCTTAAAAA			2509

GGCTGGGTTT	Human homeobox gene, complete cds.	M60721	2510
GGCTGGGGTC			2511
GGAATATGCA			2512
GGGCAAGCCA	Human estrogen receptor-related protein (hERRa1) m	L38487	2513
GCTAGGCCGG			2514
GTATGACCAG			2515
GCTGCCCCTG			2516
GTCCTGCTCC			2517
GTCTTTAGGA			2518
GTGAAACCAC			2519
GCTGGCTGGG			2520
GTGAAACCAT			2521
GTCCCAAAAT	H. sapiens cDNA for RFG.	X77548	2522
GTGAAACCGT			2523
GCTACAGGTA			2524
GTGACAGCCA			2525
GCGTGGCTCA			2526
GTGACGGGCG			2527
GCGGCCTCAG			2528
GCTCCCTCCT			2529
GCTTCTGCCA			2530
GAGAAAAAGT			2531
GGAAGTTAAG			2532
GGAACTCTGT			2533
GGAAAGTGAC			2534
GGAAACCCCA	Homo sapiens dishevelled 3 (DVL3) mRNA, complete c	AF0060	2535
GCTGCCTGCC			2536
GCTTGAATTA			2537
GTATGTCCAT			2538
GTATTGGAGA			2539
GCTTCCTCTG			2540
GTATTTGTGG			2541
GCTTATGCTT	Human mRNA for uKATP-1, complete cds.	D50312	2542
GCTTAATTGT			2543
GTCAACTGCT			2544
GCTTGGCTCC			2545
CCTGGCCCTA			2546
CCGAATACCG			2547
CCGCCTCCGG	Human lupus autoantigen (small nuclear ribonuclepo	J04615	2548
CCGGAATGTG			2549
CCGTGAAAAA			2550
TACTTGGTCT			2551

CCTAAGGGAG	Homo sapiens transcription factor SL1 mRNA, comple	L39059	2552
TACTTGCTAT			2553
CCTATAGTCC	Human mRNA for D-aspartate oxidase, complete cds.	D89858	2554
CCTATTAAAC			2555
CCTCAGCCCT	Human tyrosine phosphatase mRNA, complete cds.	M77273	2556
CCTCCCAGCT			2557
TACTGGTGTA			2558
TACTGATTAC			2559
CGGATCCAGT			2560
CCTTTGAAAC			2561
GTTTATGTTC			2562
CGCCCGGAAC			2563
CGCCAAGCTG			2564
CGCAAAAAAA			2565
CGACTGTAAT			2566
CCTGATGAAG			2567
CCTTTGTAAA			2568
CCTGCCAAAG			2569
TACGGGGATC			2570
CCTTGGGCCT			2571
CCTTGCTTTT			2572
CCTGTCTGCA			2573
CCTGGCTCAA			2574
TAGTCTGGAG	Human CDP-diacylglycerol synthase mRNA, complete c	U65887	2575
CGAATAAAAT			2576
CAGGTCATAC			2577
CCCTGGGGTT			2578
CATTCTCCTA			2579
CATCCCCACC			2580
CATCAGCACT			2581
CATCACACTC			2582
CATTTTATTT			2583
CAGGTGGTGA			2584
TATGGGGTCA			2585
CAGGGGAAGG			2586
CAGGGATCTG			2587
TCAAGTTCAC			2588
CAGGCTTTTT			2589
TCAATGGACA			2590
TCACAATAGG	Homo sapiens expressed pseudo TCTA mRNA at t(1;3)	L41143	2591
CAGTTCCATA			2592

CCCAGGAGGA			2593
CGGCCACAGA	Human HepG2 partial cDNA, clone hmd2c12m5.	D16990	2594
TATAAAATTT	Human fumarase precursor (FH) mRNA, nuclear gene e	U59309	2595
TATCTTCTAA	Human hypoxanthine phosphoribosyltransferase (HPRT	M31642	2596
CCCCTTTGCA			2597
CCCCAAGCTA			2598
TATGTGCTGT			2599
CCCAGTGGCC			2600
TAGGCAACAC			2601
CCATTGTACT			2602
CCAGGCACTG			2603
CCACTTCTGG			2604
TATGGCTACA			2605
CCACAATCCT			2606
CCAAGACTTC			2607
CCCATTGTCC			2608
GAAAAGGTTA			2609
CTTACTCGGG			2610
CTTATAATCC			2611
CTTCCAGTAA			2612
CTTCGCGATG			2613
CTTCGGGCTG			2614
TAAATAAAGC			2615
CTTGTAACAG	Human laminin B1 chain mRNA, complete cds.	M61916	2616
CTTGTAGTCC			2617
TAAACCTGTC			2618
CTTTCAGTTT			2619
TAAAAAGCAG			2620
CTTTGATCAG			2621
GTTTTGTACA			2622
TACCTTCCTT			2623
GAATGTCCTT			2624
GACTCTCTCA			2625
GACGTTCACT			2626
GACCTGACCC	Human zinc finger protein (ZNF154) mRNA, partial c	U20648	2627
GACCCCCTGA			2628
GACCACGGCG			2629
CTTTTCTTTA	Human DNA/RNA-binding protein mRNA, partial cds.	U20272	2630
GACACCGAGG			2631
CTTTTGTGCA			2632

GAAGCATCGC			2633
GAAGAAAAGC			2634
GTTTGATTTT	Human hexokinase 1 (HK1) mRNA, complete cds.	M75126	2635
GAAATGGGGC			2636
GAAAGGCACT			2637
CTGTGCAGAC			2638
GACATTGCTG			2639
CTAGCTCACG			2640
CTGTTTAAAC	Human clone 23840 mRNA, partial cds.	U79267	2641
CTCGGATTCA	Human protein kinase mRNA, complete cds.	L33801	2642
CTCCGGCCCA			2643
CTCAAGCGGC	Human tat interactive protein (TIP60) mRNA, comple	U74667	2644
CTCAACAGAG			2645
TACACCAGCA			2646
CTAGGTAGTG			2647
CTGAAGAGAG			2648
CTACGTGCTC			2649
CTAAAAAATG			2650
CGTGGCCACG	Human mRNA for choline kinase.	D10704	2651
CGGGCAGAAA			2652
CGGGAGCCGG			2653
TACATCCGAA			2654
CTATGATAGT			2655
CTGGATAGGA			2656
AAAGAAATGG			2657
CTGTGATTGT	Homo sapiens FLICE-like inhibitory protein long fo	U97074	2658
CTGTCCTAGC	Human clone 23665 mRNA sequence.	U90913	2659
TAAGATTAGA			2660
TAAGATTTCA	Homo sapiens heterogeneous nuclear ribonucleoprote	AF0003	2661
CTCTCATCTC			2662
CTGGCCGGCT			2663
CTGTGTAAAG			2664
CTGGAAATAA	Human adrenodoxin reductase mRNA, complete cds.	J03826	2665
CTGCTTTCTG			2666
CTGCTGAGCC			2667
CTGCCCAGTG			2668
CTGATGACCA			2669
CTGAATGCCC			2670
TAATAAAGAA	Human mRNA for cytokeratin 15.	X07696	2671
GTGCCCTGTT	Homo sapiens mRNA for KIAA0587	AB0111	2672

	protein, complete c		
GGGCTGTTTG			2673
GGGGACTGGT			2674
CGTCCCCTCC			2675
GGGGCTTCTG	Human mRNA for cysteine protease, complete cds.	D55696	2676
CGGTTCCCAC			2677
GGTGGATCTC			2678
CGGCAGGTGA			2679
GTAAGGTTGG			2680
CGGACATAGG			2681
CGGAACACCG			2682
GTCCGCCAGG			2683
CGGAAAAAAA			2684
GTGAAGCCCC			2685
CGACTGCACT			2686
CGCAAGTGGT			2687
CTGAACCCGG			2688
GTTTGCAAAC			2689
GTTTAAAAGA			2690
CGAGCATCCC			2691
GTGTGGGAGA			2692
CGCGTTAAGA			2693
CGCAACTTCA			2694
CGCCGCTTCT			2695
CGCAGAGGCC			2696
GTGGCGGACA			2697
CGCCGCCGGG			2698
GTGGAACCCC			2699
GTGCTGGTCA			2700
CGTTGGCAGG			2701
GTGTCTTGTA			2702
CTCCCCCACC	Human mRNA for KIAA0338 gene, partial cds.	AB0023	2703
GGGCTGTTAG			2704
CTAGATTCGG			2705
CTAGGATGCG			2706
GCTCTGGCCG	Human mRNA for endonuclease III homolog, complete	AB0015	2707
GCTCTCGGCG			2708
GCTTCCTAAA	H.sapiens mRNA for cystathionine-beta-synthase.	X82166	2709
CTCAGATTCC			2710
CTACTGTCTA			2711
CTCTTGTGGC			2712
GCGGCCACCA			2713

GCCTTTCCCT			2714
GCCTTGATGA	H.sapiens integrin associated protein mRNA, comple	Z25521	2715
CTCTTGTGGT			2716
CCCTGGGAAG			2717
CTATTTTTGT			2718
CTAATACTTC			2719
CGAAGGCTGT	NF-IL3A=interleukin-3 promoter transcriptional act	S79880	2720
CGTTTGAAAA			2721
CTAAAACTGG			2722
GGCTTGGTTT			2723
GGCTGCCCAG	H.sapiens mRNA for MUF1 protein.	X86018	2724
GCTGGCAGGC			2725
CTAAGATTCG			2726
CGTGTTGAGA			2727
GGCCTCCCAG	Homo sapiens N-acetylglucosamyl transferase compon	AF0301	2728
GGCACCGCGT			2729
GGATGTGAAA	Human MIC2 mRNA, complete cds.	M16279	2730
CTAATGCTAG	Human mRNA for KIAA0206 gene, partial cds.	D86961	2731
GGAGCCAGAG			2732
CTACCCTTTC			2733
GGCTCAGGGC			2734
CCGTAGAGGA			2735
CCTCCAGCCC			2736
TCTCTCTGCA			2737
CCTCAGTATA	BPTP-2=protein-tyrosine phosphatase [human, pre-B	S78086	2738
TCTGGGGACG			2739
CCTATGGAAA			2740
TCTGTCAATC			2741
TCTTCCCCAG	Human selenoprotein W (selW) mRNA, complete cds.	U67171	2742
TCTTTCACCC	Homo sapiens mRNA for antizyme inhibitor, complete	D88674	2743
CCTAGCCCCA			2744
CCTACTGCAC			2745
CCTACTACGT			2746
TGACCACCCT			2747
TGACTTTCCT			2748
GTTTGGATCT			2749
TGCTACGATC			2750
AAACGTTTCC			2751
TGGCAGCGCC			2752

CCGAGGCAGG			2753
TGGAGAAAGA			2754
TGGAAGCATC			2755
CCTAAATAAA			2756
TGCTTGACAA			2757
TGAGTTGGGT			2758
CCGCGGTGGC			2759
CCGCTGGGCT			2760
TGCCCTGAGA			2761
CCGGGTGCCC			2762
CCGGTAATCC			2763
CCTCTGGGGT			2764
CCGCCTCCTA			2765
TACATTCACC	Human mRNA for protein D123, complete cds.	D14878	2766
CCTCCAGGGT			2767
TAGGACCCTG	Homo sapiens mRNA for lysosomal hyaluronidase.	AJ0000	2768
CCTGTCCACA			2769
CCTGTGGTTC			2770
TAGACTTCCT			2771
CCTGTCACGA			2772
TACCAGGAAC			2773
TATCCTAGGG			2774
CCTTGCTGTG			2775
TAATTTAAAA			2776
TAATACCAAG			2777
CCTTGGGTTC			2778
CCTTTCCTAC			2779
CCTTTTACCT			2780
CCTTCATCCT			2781
CCTGGCTCCC			2782
GCCGCCGCCG			2783
CCTGCATCCC			2784
CCTGGATCTC			2785
TCCAGAATAA			2786
CCTGGCCAGT	Human destrin-2 pseudogene mRNA, complete cds.	U72518	2787
TAGGCCACCA			2788
CCTGGCCCTG			2789
TCTATAGCTT			2790
TCATCATATT			2791
TCAGTGACCA	Human erythroid isoform protein 4.1 mRNA, complete	J03796	2792
CCTGGCTCGA			2793
CCTGGGTCAG			2794

TATTAAATAG			2795
CCTGTAATGC			2796
TCCAACTACA	Homo sapiens hydroxysteroid sulfotransferase SULT2	U92315	2797
CACGATTAAA			2798
GAAGTCATTT			2799
ATGGCCAGAA			2800
GAAGTAGGAC			2801
ATGTATGGGG			2802
ATGTGTTTCA			2803
GAAGCCATCC			2804
ATTGTAGACA			2805
ATTGTGCCAC			2806
ATTTGAGAAA			2807
GAAGACAGTG	Homo sapiens clone rasi-3 matrix metalloproteinase	U38320	2808
GAAGAACAGA			2809
GGGGGACCTC			2810
CAAGGTCATT	Human tight junction (zonula occludens) protein ZO	L14837	2811
GAAAAAATAA	Human dihydroorotate dehydrogenase mRNA, 3' end.	M94065	2812
GAACCCCAGG			2813
GCCTGCCCTG			2814
GAAATCAGTG			2815
GAAATGTCTG			2816
CAGTTTGTAC	Human pyruvate dehydrogenase E1-alpha subunit mRNA	J03503	2817
CAGTTCTCTG			2818
CAATTGTAAA	Homo sapiens thioredoxin-related protein mRNA, com	AF0526	2819
CAGGTTGTGA	Human mRNA for lysosomal acid phosphatase (EC 3.1.	X12548	2820
CACCACAACA	H. sapiens RNA for CLCN3.	X78520	2821
CAGATTTGCA			2822
GAACGACCTC			2823
GAACGCTGAA			2824
GAACTCCATA			2825
GAACTGGAGA			2826
ATGCCCGTGA			2827
GAACACCGTC			2828
AGACTAACAC	Human mRNA for TESK1, complete cds.	D50863	2829
ATGGCAAGGT			2830
GACGAGCCAC	Homo sapiens mRNA from chromosome 5q21-22, clone:F	AB0024	2831

AGGACTTCTG			2832
GACGCGGCGC			2833
AGCCTGCCTG	Human heat shock factor 1 (TCF5) mRNA, complete cd	M64673	2834
AGGGCCCTCA			2835
AGAGCAAACC	Homo sapiens lysyl hydroxylase (PLOD) mRNA, comple	L06419	2836
AGGGGGGAGG			2837
AGAACCTTTG			2838
GACGTGATGG	Homo sapiens KIAA0406 mRNA, complete cds.	AB0078	2839
ACTTTTTCAC			2840
ACTGTGGTTT			2841
ACTGTCTGTC			2842
ACTGTAATCC			2843
GACGGCTACT			2844
GAATTCCTCG			2845
CCCAACCCCT	Human DRPLA mRNA for ORF, complete cds.	D31840	2846
ATGCAGAGAT			2847
GAAGTTTTTT			2848
GAATCGAAGT			2849
GAATCTCAGC			2850
GACCCTTCTC			2851
GAATGATTTC			2852
ATGCTAGATT			2853
ATCAAATGCA	Human (Daudi) translocated t(8;14) c-myc oncogene	K02276	2854
ATAGATGGGG			2855
GACAGCCATC			2856
GACCCAGGAG			2857
AGTAGCGAAC	H.sapiens HCG V mRNA.	X81003	2858
AGGTACTGGT	H.sapiens c-abl mRNA 3'-fragment.	X51945	2859
GAATCTTCTC			2860
GAGTTCCTCG	Homo sapiens erythroid K:Cl cotransporter splicing	AF0545	2861
GAATAAATGT			2862
CTGTCCGGCT			2863
CTGGTCCTGG			2864
CTGGGCTACT			2865
CTGGGATCTG			2866
CTGGCCTGTA			2867
CTGGCACTTA			2868
CTGGAGCCGC			2869
GAGCTGTTGG	Homo sapiens integrin alpha E mRNA, complete cds.	L25851	2870

CTGCTTTTTT	Homo sapiens clone 24658 mRNA sequence.	AF0550	2871
GAGGCATATG			2872
GAGGCTCCGA			2873
GAGGGGAGGA			2874
GAAAGTGCAG	Homo sapiens mRNA for VRK2, complete cds.	AB0004	2875
CTGCCCTCCC	Human alpha-L-iduronidas (IDUA) mRNA, complete cds	M74715	2876
CTGATGTTCC			2877
CTGATTTATT			2878
GCAGCCTGGA			2879
CTGCAAAGGA	Homo sapiens phospholipase D2 (PLD2) mRNA, splice	AF0384	2880
GCACCTTCTG			2881
CTGCTGGGCA			2882
CTGCAGAATA			2883
GAGTTATGAG			2884
GATTGGACTT			2885
CTGCGAGTGA			2886
CTGCTGAAGT			2887
GATCAAGGGT			2888
CTGCTGCCCC			2889
CTGTGCTCTA			2890
GCACAAGAGT			2891
CCTCCCTGCT			2892
CTGTGCTCAC			2893
CCTTGGTTTT	Homo sapiens UEV-1 (UBE2V) alternatively spliced i	U97279	2894
CTTTCCCTCA			2895
CCTGTAATTC	Homo sapiens mRNA for KIAA0591 protein, partial cd	AB0111	2896
CTTTCCTTTT	Human uncoupling protein homolog (UCPH) mRNA, comp	U94592	2897
CTTGTGAGGC			2898
CTTTTAAAAT	Homo sapiens mRNA for cytochrome c, partial cds.	D00265	2899
CTTGCCTGAA	Homo sapiens amphiphysin II mRNA, complete cds.	AF0013	2900
CCTATCATAT			2901
CCCGTCCCGG			2902
CCCCTGCCAT			2903
CCCCACCGCC	Homo sapiens DCHT mRNA, complete cds.	AF0176	2904
CTTTTGGCTG	Human squalene synthetase (ERG9) mRNA, complete cd	L06070	2905

CCCATCCGCA			2906
CTTTCTGGGC	Human putative outer mitochondrial membrane 34 kDa	U58970	2907
CTTCATAAGG			2908
TGGTTGAACC	Homo sapiens TTAGGG repeat binding factor 2 (hTRF2	AF0029	2909
CTTTTCAAGA	H.sapiens, gene for Membrane cofactor protein.	X59408	2910
CTGTTAATCA			2911
CTGTTTGTTG			2912
CTTCAACAAC			2913
CTTTAGCTAC			2914
CTGGATGGGC			2915
GAAGGTGGAG			2916
CTGCCCTGGG			2917
CTTCTAGCAA			2918
CTTCTTTCCA			2919
CTCTGTTGAT	Human antioxidant enzyme AOE37-2 mRNA, complete cd	U25182	2920
CTACCAGGAA			2921
CTAACGCAGC			2922
CTTCAGGCAA			2923
AGAATAAAAT			2924
AGCTTCCGCT			2925
AGCTGGATGC			2926
AGCCTCCCAG			2927
AGCCCTGGAC			2928
AGCCCAGGAG			2929
AGCCCAGCTG			2930
AGCCAACTCA			2931
AGCAGCCCCT			2932
AGATGGACAT			2933
AGATCCTACT	squalene synthase=farnesyl diphosphate:farnesyl di	S76822	2934
AGAGCCCAAG			2935
AGAGATCACA			2936
AGACTTGTTT			2937
ACGTGACACC	Homo sapiens mRNA for KIAA0541 protein, partial cd	AB0111	2938
ACTCCTGCCT			2939
ATATTTCATT	Homo sapiens mRNA variant beta for RNA polymerase	AJ2241	2940
ACTACCCCTG			2941
ACTAGAAACC			2942
ACTCAAATCT			2943
ACTCAGGTGA			2944

AGACAGCCGC			2945
ACTCCAGTGC			2946
AGAATAAACG			2947
ACTGACGCTT			2948
ACTTCACCCT			2949
ACTTCCTTCC	Human ionotropic ATP receptor P2X5b mRNA, complete	U49396	2950
ACTTCTTCAC			2951
ACTTTTTAAA			2952
AGGAATTTGA			2953
ACTCCAGAAA			2954
AGTGATTTGC			2955
AGCTTTTTAA	H.sapiens small nucleolar RNA U36a.	X97584	2956
AGTCCTTATG			2957
AGTCTCTGTT			2958
AGTGAACCCA			2959
AGTGACCGAA			2960
AGTATCCTCC			2961
AGTGATGGCG			2962
AGTATCAATC			2963
AGTGTACTCC			2964
AGTTTCAGAG			2965
ATAAAGAAGG			2966
ATAATTTTTA			2967
ATACATAATT			2968
CCCTTCTGGC			2969
AGTGAGGATG			2970
AGGCTGGACG			2971
ACGGCCGCCT			2972
AGGACAAACC	Homo sapiens GDP-mannose 4,6 dehydratase mRNA, com	AF0423	2973
AGGACAAGTC			2974
AGGACGTCAT			2975
AGGAGCCTCA	Human collagen type XII alpha-1 precursor (COL12A1	U73778	2976
AGTCAAGCCC	Homo sapiens skeletal muscle LIM-protein FHL3 mRNA	U60116	2977
AGGCTCTGAG			2978
AGGAAGCTGA	Human mRNA for uracil-DNA glycosylase.	X52486	2979
AGGGCACTGA			2980
AGGGCAGGGA	Homo sapiens RaP2 interacting protein 8 (RPIP8) mR	U93871	2981
AGGGCCGACT	H.sapiens mki67a mRNA (short type) for antigen of	X65551	2982
AGGGCTGCCA			2983

AGGGCTTTCC			2984
AGGGTTGCTT			2985
AGGAGCCTTA			2986
AAGCTCCATC			2987
AATGTCCAGT			2988
AATGTCAGCA			2989
AATGGGGGTT			2990
AATGGGGAGA			2991
AATATTAAGA	Homo sapiens U5 snRNP 100 kD protein mRNA, complet	AF0264	2992
AATATCTTGC			2993
AATATCTGAC	Human guanine nucleotide regulatory protein (ABR)	U01147	2994
AATATCATTG			2995
AATACACAGA			2996
AATAAAAGTG	H.sapiens mRNA for phospholipase C-b3.	Z26649	2997
AAGTTTTCCT			2998
AAGTATGTGA			2999
AAGGTGCTGG			3000
ACGTGAGTGC			3001
AACGGACTCT			3002
AAAGGATAAT	Human basic transcription factor BTF2p44 mRNA, 3'	U21910	3003
AAAGGCACTG			3004
AACACAGTGC			3005
AACCAATCTG			3006
AACCATTTTT			3007
AAGGAAGATA			3008
AACCCAATCC			3009
AAGGAAAACG			3010
AACTTTTGGC			3011
AAGAACTTTG			3012
AAGAAGGCAA	Human albumin D-box binding protein mRNA, complete	U79283	3013
AAGAGCGACT			3014
AAGAGCTTGC			3015
AATTCCCGTC			3016
AACCCAAAAA	Human (nmc) mRNA, partial cds.	U31214	3017
ACCTGCATCA	Homo sapiens mRNA for protein phosphatase 2C gamma	Y13936	3018
AATGTGTCTC			3019
ACCCGCGTGC	Human chorionic gonadotropin (hcg) beta subunit mR	J00117	3020
ACCCTGGCCC			3021
ACCCTGGCTG			3022

ACCGCCGGGC			3023
ACCATCTCTG			3024
ACCTCCGTGT	Human angiotensinogen mRNA, complete CDS.	K02215	3025
ACCAGGTGGA			3026
ACCTGGCTTT			3027
ACCTGTTGCC			3028
ACCTTGACAC			3029
ACCTTGTAAT			3030
ACGAGGATCT			3031
ACGATGCTGC			3032
ACCTCCATTT	Human c-sis oncogene mRNA, 3' flank.	M32009	3033
ACACTTCTTG			3034
ATCAAGTTCC			3035
ACAAAATAAA	Homo sapiens NRF1 protein (NRF1) mRNA.	L24123	3036
ACAAACCCCC			3037
ACAAGCATCC			3038
ACACAGACGG			3039
ACCCACTTTC	Human mRNA for KIAA0310 gene, complete cds.	AB0023	3040
ACACAGGCTT			3041
AATTATGCGG			3042
ACACTTCTTT	Human G protein gamma-11 subunit mRNA, complete cd	U31384	3043
ACACTTTTTT			3044
ACAGCTTTGT			3045
ACATAAGACA			3046
ACATCTGGCT			3047
ACATTGGGTA			3048
ACACAGCTCT			3049
CCAACTCCTA			3050
CCCATCGTCG			3051
CCCACTCTTT			3052
CCCACTATGT			3053
CCCAAGAGAA			3054
CCCAACGCTG			3055
CCCAAAGCAC			3056
CCATCCAGTG			3057
CCAGTCTGGG			3058
CCAGGGCTGA			3059
CCAGGAGGAG			3060
CCAGCAGTGG			3061
CCACTGGCAC			3062
CCACAGTAGA	Homo sapiens zinc finger transcription factor (ZNF	AF0460	3063

CAGGCCTTGG			3064
CATCTTTTTA	Homo sapiens dolichol monophosphate mannose syntha	AF0078	3065
ATATGCCACA			3066
CAGGTGACAA	Human mRNA for KIAA0304 gene, complete cds.	AB0023	3067
CAGGTGCTGG			3068
CAGTATTTAA			3069
CAGTGGTCTG	Human replication factor C large subunit mRNA, com	L23320	3070
CCACAGGCAG			3071
CATATGAAAA			3072
CCAAGGGTCC			3073
CATTCATTGG			3074
CATTGTAAAT	Human maspin mRNA, complete cds.	U04313	3075
CATTGTCTTC			3076
CATTTGGGAA			3077
CCAAACCATC			3078
CCCCAGGAGA			3079
CATAACTTAC			3080
TTAGTTACCT			3081
CCCATTTGCA			3082
TTGCCATTGG			3083
TTCTGGTGCG			3084
TTCTGCCCCC	H.sapiens mRNA 3'-region (unknown function).	Y12338	3085
TTCTCTACAA			3086
CCCTCCCAGG			3087
TTATCGTCCT			3088
TTGTCCGGGC	Human tubulin-folding cofactor C mRNA, complete cd	U61234	3089
TTACTATTCA	Homo sapiens mRNA for putative glucosyltransferase	AJ2248	3090
CCCTCGAAGC			3091
TTAAGTGGAA			3092
CCCTGAATCC			3093
TGTGAGCCCT			3094
CCCTGCCCCC			3095
TTCCCTGGGA			3096
CCCCTCCCCT			3097
CAGGCCAACC			3098
CCCCCCACCC			3099
CCCCCTTGCA	Human mRNA for GC-Box binding protein BTEB2, compl	D14520	3100
CCCCGCAGCT			3101
CCCCTACATC			3102

CCCTCCTGGA			3103
TTTGTCAGGC			3104
CCCCAGCTGC			3105
CCCCTCCTGG			3106
CCCCTTCCGG			3107
CCCGAGGCAG			3108
TTTATTCCTC			3109
CCCGGCCAGC			3110
TTGTTGCTGA			3111
CCCCTCCAGC			3112
ATGCTTCAGG			3113
ATTACACTAC			3114
ATGTTGAGAT			3115
ATGTCTTTTA			3116
ATGTCTTAAT			3117
ATGTCCCCTG			3118
ATGTATTCTT			3119
ATGTACAGGT			3120
ATGGGTTTGC			3121
ATGGGGGTGA			3122
ATGGGATTCT			3123
ATGGCTAGTA			3124
ATGGCACTTT			3125
ATGGCAATTT			3126
CAGGCTTCAC	Human mRNA for KIAA0247 gene, complete cds.	D87434	3127
ATGAGATGAG			3128
ATCATTCCCT			3129
ATCCGCCGAA			3130
ATCCGCTGCG			3131
ATCTATTGAA			3132
ATCTGGGGCC			3133
ATGGCAAAGA			3134
ATGAAAAAAA			3135
ATGCTTTGAA			3136
ATGAGATGCT	Human neuroendocrine-dlg (NE-dlg) mRNA, complete c	U49089	3137
ATGAGCAACT	Human MAP kinase phosphatase (MKP-2) mRNA, complet	U48807	3138
ATGATGTCCT			3139
ATGCACATAA	H.sapiens mRNA for apolipoprotein E receptor 2.	Z75190	3140
ATGCAGAATT			3141
ATTCTTTCCT			3142
ATCTTCGCTT	Human mRNA for KIAA0067 gene, complete cds.	D31891	3143

CAGCAGCTGC	Human HepG2 partial cDNA, clone hmd3b11m5.	D17022	3144
ATTAGTCAGA	Human testicular inhibin beta-B-subunit mRNA, 3' e	M31682	3145
CACGCTCACT			3146
CACTATGCAC			3147
CACTATTCAC			3148
CAGACTCCCG			3149
CACCAAAATA			3150
CAGCACGAAA			3151
CACCAAAAAA			3152
CAGCCGAGGC			3153
CAGCTATCAT			3154
CAGCTGCAGA			3155
CAGCTTAATT			3156
CAGGAAAGGC			3157
CAGGACGGGC	H.sapiens encoding CLA-1 mRNA.	Z22555	3158
CAGCACCAGG	Human 5'-AMP-activated protein kinase, gamma-1 sub	U42412	3159
ATTTTTTCCA			3160
GACTCGTGGA			3161
ATTGCGCCAC			3162
ATTTACAAGA			3163
ATTTCGTGGG			3164
ATTTCTCTAA			3165
CACCCTAATT			3166
ATTTTAAGGG			3167
ATTATGGGCA	Human nuclear factor kappa-B DNA binding subunit (	M58603	3168
CAAAATTCAG			3169
CAACTCTATG	Human DNA topoisomerase II (top2) mRNA, complete c	J04088	3170
CAAGAAGAGC			3171
CAAGCGCTCT	Homo sapiens clone cRT16 CREB-binding protein mRNA	U89355	3172
CAAGGGGGCA			3173
CACAATATTG			3174
ATTTGTGAGC			3175

Table 2

Breast Cancer - Transcripts downregulated in metastatic breast tumor cells

[redacted]	[redacted] Description	Accession	SEQ ID NO
GTGCGGAGGA	Human mRNA for serum amyloid A (SAA) protein parti	X51441	3176
TACCTGCAGA	Human mRNA for cystic fibrosis antigen (CFAg).	Y00278	3177
CTCGGGGGAA	Homo sapiens serum amyloid A2-beta (SAA2) mRNA, co	M23700	3178
GGTCAGTCGG			3179
GTTCACATTA	Human mRNA for HLA-DR antigens associated invarian	X00497	3180
GCCCAGCATT	Homo sapiens prostate stem cell antigen (PSCA) mRN	AF0434	3181
ACCCGCCGGG			3182
AGAGGTGTAG			3183
GTGGCCACGG	Human mRNA for calcium-binding protein in macropha	X06233	3184
GTGACCACGG			3185
TGGCCCTCAG			3186
GACTCTTCAG	Human alpha-1-antichymotrypsin mRNA, 3' end.	J05176	3187
CCGACGGGCG			3188
CCGGCCCTAC	Human DD96 mRNA, complete cds.	U21049	3189
TACCTCTGAT	H.sapiens mRNA for calcium-binding protein S100P.	X65614	3190
CCTGAGGGTA			3191
ATTGGCTTAA	prohibitin [human, mRNA, 1043 nt].	S85655	3192
GCCTTAACAA	Human pre-B cell enhancing factor (PBEF) mRNA, com	U02020	3193
ATGGTGCACG			3194
ACCAGCATAG			3195
CTGCAGGGCC			3196
CTAACTAGTT			3197
GGTTTGGCTT	Human mRNA for mitochondrial hinge protein.	Y00764	3198
ATCCTTGCTG	Human radiated keratinocyte mRNA for cysteine prot	X05978	3199
TCTCAATTCT			3200
TGCCCTCAGG			3201
TTGAATCCCC	H.sapiens encoding skin-derived antileukoproteinas	Z18538	3202
TGGAAGCACT	Human monocyte-derived neutrophil-activating prote	M26383	3203
GCAGGAGGTG			3204

GTGGGCCACG			3205
GCCGTTCTTA			3206
GTGGCCCACG			3207
GAGCAGCGCC	psoriasin {3' region} [human, psoriatic skin lesio	S81991	3208
CTAATAAACT			3209
CGAGCTTCCA			3210
CAGACTTTTT			3211
GCACAGAGCT			3212
GATCTCGCAA			3213
TCCTGCAGCT			3214
GGCTGGGGGG			3215
CCTGCTGCAG			3216
TGGCCCTCAA			3217
CAAGTTTGCT			3218
CAAGGGCTTG			3219
ATTTTCTAAA			3220
TGAGGAAGAC	Human ionizing radiation resistance conferring pro	U18321	3221
CTGAGAAACT			3222
GAGGCTCAAT			3223
CACCTAAATT			3224
ATCCATCTGT	H.sapiens hnRNP-E2 mRNA.	X78136	3225
TGGCGTACGG			3226
TTGTAAACTT	Human FK506-binding protein 25 (FKBP25) mRNA, comp	M90309	3227
TTGGGGGTTC			3228
AAGATAATGC			3229
GGCAACGTGG			3230
GATTGGGGAT			3231
TGTGTTGAAG			3232
AATAAATGGA			3233
GGGCCTGACA			3234
TGCCCTCCAG			3235
ATTAAGAGGG			3236
CCCCAGCCCC			3237
CCCATCGGCC			3238
ACCGCCGTGG	Human neutrophil cytochrome b light chain p22 phag	M21186	3239
AAGGTGGCAA			3240
GACCAGCTGC			3241
CTGATGGCGA			3242
AATGGATGAA			3243
CCTATGTAAG	H.sapiens mRNA gene for hnRNP G protein.	Z23064	3244
CCTGGATAAA			3245

AGAAGATCTG			3246
ACCCAGAGCT			3247
TGTCTGATGC			3248
TAATTTTGAA			3249
TTCCCTCGTG			3250
GCAACAACAC			3251
AATGCAAAAT			3252
AACGCAGGAG			3253
CTAAGAACTT			3254
GTGGCCAAGG			3255
CCCTTGAGGA	Human small proline rich protein (sprl) mRNA, clon	M19888	3256
TTTACTGGTA			3257
AGCAGAGATC			3258
TTGAAACTTT	Human gro (growth regulated) gene.	J03561	3259
CCCGCTCTTG			3260
AGGGAGGCAG			3261
CCCAGGCCCA			3262
GTGCCGACAG			3263
CACCAATGTG			3264
CCAAAAAAAA	Human interferon-induced leucine zipper protein (I	U72882	3265
GGATCCTCGG			3266
TTATGCTTTC			3267
CCTGTGTTGG			3268
AAATTGTTCC	Human mRNA for proteasome subunit HC8.	D00762	3269
CCTAGCTGGG			3270
GGCAGCAATG	Human mRNA fragment for mesothelial type II kerati	X03212	3271
AGGTCCACCA			3272
ACACTACGGG			3273
CTGGCCCTCG	Human estrogen receptor mRNA, partial cds.	M12075	3274
AATATATCCA			3275
CTCGCGCTGG			3276
CTTAATCCTG			3277
CCACAAACGG			3278
TGCCCTCAAA			3279
GGCTTGCCAG			3280
TGCCCTCAGA			3281
TTTGAAATGA	Spermidine/spermine N1-acetyltransferase mRNA, com	M77693	3282
AGCTCTTGGA			3283
TACCTGGCAG	Homo sapiens clone 23579 mRNA sequence.	AF0381	3284

GACTAACACC			3285
GATTTCCTTG	H.sapiens ADE2H1 mRNA showing homologies to SAICAR	X53793	3286
GCAATAAATG	Human mRNA for drebrin E, complete cds.	D17530	3287
GCCCGTCCGG			3288
ACCCACCTGC			3289
TGGTTTTGGC			3290
GACCCCTGTC	Homo sapiens (clone s153) mRNA fragment.	L40391	3291
CCGAGGCTGC			3292
TACCTGCCAG			3293
TGAAGAGAAG	Human mRNA for KIAA0106 gene, complete cds.	D14662	3294
GAGTTGGGTA			3295
GATTGATGTC	Human 38 kDa Mov34 isologue mRNA, complete cds.	U70734	3296
TACAGGAAGT			3297
GGGCTGGGGG			3298
GAGTGAGCAG			3299
TAATTTGCGT			3300
GTGGTATGTG			3301
GGGGACGGGA			3302
GGTGGCTTTG	Homo sapiens NADH-ubiquinone oxidoreductase subuni	AF0471	3303
GTGGCTCTAT			3304
GTGATGGCCA			3305
TAACAGTTGT			3306
AGGAGAGGGA			3307
TGCAGATATT	Human protein phosphatase (KAP1) mRNA, complete cd	L27711	3308
TGCCCCTCAG			3309
GCTAAACTGC			3310
TTTTTCTTAA			3311
ACAGCCTGCA			3312
TGGTGTATGC			3313
TACTGGTTTA			3314
TTTATTTAGC	Homo sapiens clone 24707 mRNA sequence.	AF0550	3315
ACGCAGGGAG			3316
TTGGGTCCTC			3317
AGCAACAGTG	Human endothelial-monocyte activating polypeptide	U10117	3318
ACCAGGCAAG			3319
AGCTTATTGA			3320
GAGCCAGGTG	Human retinoic acid-responsive	U50383	3321

	protein (NN8-4AG) m		
TTGGGGTTCA			3322
ATGAAACCCT			3323
CAGAGGCCCT	H.sapiens IKBL mRNA.	X77909	3324
TTCTCTCCAA			3325
CCCAGAACAG			3326
CCCTAATTGG			3327
CCTGAGTTGA			3328
GAGAACCGTA			3329
CTCACTTCTT			3330
CTGGTTGTAG			3331
GACCCTAGCT			3332
GTGTCTCATC	H.sapiens mRNA for 2-phosphopyruvate-hydratase-alp	X84907	3333
GGGTGCAAAA			3334
TAAGGTTGTC			3335
TAAGCAGATG			3336
AGGTCCTGCT			3337
AGTCTGTCCA	Human mRNA for prolyl 4-hydoxylase beta subunit (E	X05130	3338
TGCAGGCCTG	H.sapiens mRNA for IFP53.	X62570	3339
GTGGGTTGGC	Human aldehyde dehydrogenase 2 mRNA.	K03001	3340
GGATGTAGAG			3341
CAGCGCCACC	Homo sapiens serine threonine kinase 11 (STK11) mR	AF0356	3342
CATTCAGTTG			3343
GTGCTAGATT			3344
ATGAGCTGAC	Homo sapiens cystatin B mRNA, complete cds.	L03558	3345
CCCCCGTACA			3346
ACCACAGTTT			3347
GGTGGCACTG			3348
GCGGCGACTA			3349
GGGGCAGGCC			3350
GTTGTCTTTG	Human complement component C3 mRNA, alpha and beta	K02765	3351
CGTCTGTAAG			3352
CTATGGTGTT	HNL=neutrophil lipocalin [human, ovarian cancer ce	S75256	3353
TAGGACAACT			3354
GCCGAAGGAA			3355
GCCCTGCTGG			3356
GCCCGGGTGG			3357
GCCCCAGCAT			3358
GCAAAATCCC			3359

GAAACTGTGA			3360
GAGGGTTCCA			3361
GACACAGCAA			3362
CCCCTATTAA			3363
TCTTGATGTC			3364
AAGGATGCCA	Human mRNA for GATA-3 transcription factor.	X55122	3365
TTGCGTTGCG			3366
TTTCCTTCCT	Human brain-type clathrin light-chain a mRNA, comp	M20471	3367
TGGCACGTTT			3368
TGCCCCTCAA			3369
AACAATTGGG	H.sapiens fus-chop mRNA for fusion protein.	X71427	3370
TGCCCCCAGG			3371
TCCACTACCA			3372
TCTGTCCCCC			3373
TGGGTTTTAA			3374
TCAATAAAGG			3375
AAGTTTGCCT	Human mRNA for glutaredoxin, complete cds.	D21238	3376
TTGGGTATCC	Human glutamine:fructose-6-phosphate amidotransfer	M90516	3377
TTTCCTTTGC			3378
TAGGTTCGTG	Human cysteinyl-tRNA synthetase mRNA, partial cds.	L06845	3379
TTTAGTGACG			3380
TGACTAATTG			3381
TCGAAGAACC	Human mRNA for melanoma-associated antigen ME491.	X07982	3382
GGAAGGGGAG	H.sapiens mRNA for NF-kB subunit.	X61498	3383
CTGAAAAAAA			3384
TATGAGATAG			3385
TACTGCTCGG			3386
GCCTGGAGGG			3387
TTCATACACT			3388
CTGAGCAACA			3389
TTCTCTCCCC			3390
GTTCCAGCAG			3391
ATGGAACCCA			3392
ATGAAAGGTT			3393
GGAATCCAAT			3394
CTGATGGCCA			3395
AGTCAGTGGG			3396
GAGGAAGGCT			3397
AGGTGTGTCA			3398

GAGCAGCTGG	Human copine I mRNA, complete cds.	U83246	3399
GAGCAGATCA			3400
AGCTTCTACC	Human small proline rich protein (sprII) mRNA, clo	M21302	3401
AGCAAACTGA			3402
TTGCCAACAC	H.sapiens mRNA for a novel synaptophysin related p	X61382	3403
CGTCCTACGT			3404
AGTGTCCGGC			3405
CCCAAGTGCC			3406
CCAATGGACA			3407
GCTTTGTATC	E2k=alpha-ketoglutarate dehydrogenase complex dihy	S72422	3408
GAAACTGAAG			3409
CCACTGAACT			3410
GTGAAAGGCA			3411
CCAGTACAGC			3412
GCGGCGGCTC			3413
CCCCCAGCCA			3414
CCCCTGGGTT			3415
AGGTGGCAAA			3416
TTGTAAACAT	Human nucleolar protein p40 mRNA, complete cds.	U86602	3417
GCGTGCTCAC			3418
GCTCACGTCG			3419
CCGTAGTGCC			3420
CCCGTTCCGG			3421
CTGTGTCTGT			3422
ACACTTGGAG			3423
GTATTTAACT			3424
TCCCCGTACT			3425
CAATGTGAGC			3426
CTAAGGTGGG	Human mRNA for protein phosphatase 2A 74 kDa regul	D78360	3427
CAATTTAAGT	H.sapiens HCGVII mRNA.	X80916	3428
CAGTGTTGCG			3429
GCCTGTAATC			3430
GTGAAATCCC	Human sno oncogene mRNA for snoA protein, ski-rela	X15217	3431
CCAAATGCTG			3432
GCTGGGGACT	H.sapiens mRNA for monoamine-sulfating phenosulfot	X84653	3433
GCCTGTAATG			3434
CACGTTCCCT	Human mRNA for KIAA0263 gene, complete cds.	D87452	3435
AAGGTTTCTG			3436

CAGGACAGTT			3437
TGAAGTAACA			3438
GAGTTATGTT			3439
ATGGTGGTGG	Homo sapiens secretory carrier membrane protein (S	AF0050	3440
CCAAGCATCC			3441
TAACTGTCTT			3442
GTTTCTAATA	Human microtubule-associated protein 4 mRNA, compl	M64571	3443
TTGCTCAGGC			3444
AGGTGAGAGG			3445
AGTAGCCGTG			3446
TACCCAAATA			3447
ATGGCTGGTT			3448
ACTAACACCT			3449
GTTCCCCCGA			3450
ATTCTGGACT			3451
CAAATAAAAG	Human BENE mRNA, partial cds.	U17077	3452
TTGTCCTCTG			3453
CACTCACACA			3454
CTGCGGTGCT			3455
ATGCGCAAGG	H.sapiens (xs13) mRNA, 284bp.	Z36785	3456
ATGGCAGGTG			3457
TGGCTTCAAG			3458
TGACTTTTCT			3459
TCTTAATGAA	Homo sapiens mRNA for eukaryotic initiation factor	D30655	3460
TGTTCAGTTG			3461
AAACTGATTG			3462
TGTTTGTACA			3463
TACAGGTTTT			3464
TCAACAGCAG			3465
CCACTGCACA			3466
TATTCTCAAT	Human clone 23693 mRNA sequence.	U79254	3467
AATCCCTGTG			3468
ACACAGCAAA			3469
ACGAGCTGGA			3470
TACTCGGTTG			3471
ACGTCACCAT			3472
TTCATTAAAA			3473
GAATCATTTA			3474
CAGGCTTTGC			3475
CTGCTAGGAA			3476
CTGCTAGGGG			3477
CTGGGCAGCA			3478
AATGCTTGAT	Human retinoblastoma-binding protein	U35143	3479

	(RbAp46) mRNA		
AATGGCACTT			3480
CTGCAACCTA			3481
GAACCCAAAG			3482
CTCCTTAGAA			3483
ACCTTCAAAA			3484
ACTTGCCATT	H.sapiens RY-1 mRNA for putative nucleic acid bind	X76302	3485
GAATTTGTGT			3486
GACACACAGA			3487
GGCAGCACAA			3488
AGAAGCAAGA			3489
ACAGGGGTTC			3490
CCTGAATCTG			3491
CCACTTCAAG			3492
CCAGCTCCTT			3493
GTGCGCAGAG			3494
TTTGTTTTTA	Human prolyl 4-hydroxylase alpha (II) subunit mRNA	U90441	3495
CCCATTCGGA			3496
GTCTTTCTTG			3497
TTCCAGTAAA			3498
AAAGAATATG			3499
GACTTCTGTC	Human aldehyde dehydrogenase (ALDH8) mRNA, complet	U37519	3500
AAATGTTCTG			3501
AACTGCTTTC			3502
CGGGCCGTGC	H.sapiens mRNA for Glyoxalase II.	X90999	3503
GGGCTCTGAG			3504
CTACACCAGT			3505
CTCACGCCTG	Homo sapiens Ly-9 mRNA, complete cds.	L42621	3506
GTAATAAAAC			3507
TTAGGCAAGT			3508
CTTTTCTTCT	Homo sapiens clone 24498 RNA polymerase II 140 kDa	AF0550	3509
TCACAAGCAA	H.sapiens alpha NAC mRNA.	X80909	3510
GCCTCTGTCT			3511
TACACTACTG			3512
TAACTGCCTC	Human B-cell mRNA for a member of the short-chain	D82061	3513
GGGGAAATCC			3514
GTGATCAGCT	H.sapiens mRNA for apomucin.	Z48314	3515
TACACGTGAG			3516
GAGGAGGAGG			3517
GGGGCCAGGG			3518

TAAAATTTGT			3519
TTCTATTTTG	Human CD27BP (Siva) mRNA, complete cds.	U82938	3520
TTTCTAGTTT	Human mRNA for KIAA0108 gene, complete cds.	D14696	3521
GAGGGAAATG	Homo sapiens clone 23701 mRNA sequence.	AF0381	3522
GAGCTCTGCG			3523
TGACTGGCAA			3524
GATTTGTGTT			3525
GCTTATAGTC			3526
GAAATCCGCA	Human lysosomal acid alpha-mannosidase mRNA, compl	U68567	3527
TGATGTCCAC			3528
TGTAATCTTA			3529
TGCTGAAGAT			3530
TTGTTGGATA			3531
AGAGCCAAGT			3532
GAAGTCGGAA			3533
TGTAGTTTGA	Human RNA polymerase II elongation factor-like pro	U37558	3534
GGCTACACCT	Human mRNA for T cell receptor V beta 14 CDR3, par	D32027	3535
TAGGTTGTTC			3536
GTGGCATCCG			3537
GGCAGACAAT			3538
TGTTTTTATG			3539
GCACGCGTAA			3540
GCCGAGGAGG			3541
TTGCTCAAGT			3542
GAATCAGGGG			3543
GGCCGAGGAA			3544
AAGTGAGGAG			3545
AGGGTGTTTT	Homo Sapiens mRNA, partial cDNA sequence for human	AJ0018	3546
TACAGTATGT	glutamine synthetase [human, tumorous liver, mRNA	S70290	3547
GAGTGAAAGA			3548
CATTTCATAA	Human H+-ATP synthase coupling factor 6 mRNA, comp	M73031	3549
GAGGGAGGAT			3550
GATTTAGCCC			3551
GCCTCCAAGG	Human glyceraldehyde 3-phosphate-dehydrogenase mRN	M28283	3552
GCTGTTTTGT			3553
GGAGGGGAGG			3554

TAATAAAGGG			3555
GTTTCAGGTA	Homo sapiens calcium-ATPase (HK2) mRNA, complete c	M23115	3556
GTTACCGAGG	Human (clone 51C-3) 51C protein mRNA, complete cds	L36818	3557
GTGGCCACGT			3558
GTGGTGCCTG			3559
CAGATGTGGA			3560
GTTCCAGTGA			3561
GTTTTAAGGC			3562
CAGGGATGTG			3563
TGTCGCTGGG			3564
GTAAGATTTG			3565
CAAGTTCTTT			3566
TAGATGTGAT			3567
CAAAATTCCT			3568
TACAAAGCAT			3569
ACGTTAACCT			3570
TACTCTTGGG			3571
CAACAAAAAA			3572
TACCCATCAA			3573
CAAGGTAAAA			3574
TACCATCATA			3575
CTGTGCTCGG	Human mRNA for mitochondrial short-chain enoyl-CoA	D13900	3576
AATCTTGCAA			3577
GCTCACGCCT			3578
GTTGCTCTAT			3579
TACCATCAAC			3580
CACAACCTCC	H.sapiens SH3GLP3 pseudogene, 5' end.	X99662	3581
CACCACCACA			3582
GTGTGAAATA	Human mRNA for RanBP2 (Ran-binding protein 2), com	D42063	3583
GTTGGGACAT			3584
TAATAAAAGG			3585
TAACCGTGCG			3586
TAACCCACTG			3587
CACTAGTCCC			3588
CACTCAGTAA			3589
CACTCTATCC			3590
CAAGTAATGA			3591
GTATCTATGC			3592
GTGCTTATAA	Human protein tyrosine phosphatase mRNA, complete	L77886	3593
GGGGAGGGGG	Human mRNA for upstream binding	X53461	3594

	factor (hUBF).		
GGGCTGGTCT			3595
CCCCAGGGAG			3596
GGGAGGATTA			3597
GTGAAACCGC			3598
CCCCGTACAC			3599
GACATAGTAA			3600
GTCGGGCCTC	H.sapiens mRNA for adult folate binding protein.	X62753	3601
GTCCTGCAGA			3602
GGCTTGGCCC			3603
GTCACACTGG			3604
CCCCTTGGAT			3605
AACCAGGGAG			3606
AAACTGCATT			3607
GGCCGAGGGA			3608
GGCCGTGCTG			3609
AAATCAAGTC			3610
AAAGCGTAAA	Human interferon-gamma receptor mRNA, complete cds	J03143	3611
GGGTTTTTAA	Human FUSE binding protein 3 (FBP3) mRNA, partial	U69127	3612
CCCGACTCCT			3613
GTGAGACCCC	Human clone 2C2 Cri-du-chat critical region mRNA,	U10510	3614
AAACATTAAA	Human mRNA for enteric smooth muscle gamma-actin.	X16940	3615
GGTGACCGTC	Human cyclophilin-like protein mRNA, partial cds.	U37221	3616
AAACTCACGC			3617
GTAGATGATG			3618
AAACCAGGGC			3619
GGCTGGGGCC	Human mRNA for medullasin (leukocyte (neutrophil)	X05875	3620
GGTAGCCCAC			3621
AAAGACAGTG			3622
CCTGTGTGTG			3623
GTGTTCCCCA			3624
GTGGCACGCG			3625
GTGTTCCCAT			3626
GTGGAAACCC			3627
GTATCTTCAC			3628
GTGTGCTGGC	Human clone pJS3 interferon gamma receptor accesso	U05877	3629
TAACGTCTGC			3630
GTGCTGATCT			3631

GTGCATTTCG			3632
GTGAACCTCT			3633
GTGGCGTGCA			3634
GTGAACCCCT			3635
GTGGCGCATA			3636
CCCACGTCCT			3637
GTGCGCTAAG			3638
GTGCCACGGC			3639
CCATTGCATT	Human bfr mRNA for fibroblast growth factor (FGR)	X56191	3640
GTGAAAACCT			3641
GTGCCAGCCC			3642
GTGCCTGTGC			3643
CCAGTAGAAG			3644
GTCACACCAC			3645
GTGAACCCCC			3646
GTGCGGAAGG			3647
GGAAGGACAG	H.sapiens mRNA for vacuolar proton ATPase, subunit	X71490	3648
GTGAACCCCA	Human HepG2 3' region MboI cDNA, clone hmd3c03m3.	D17194	3649
GTGCTGGTCC			3650
GTGGAAACTG			3651
CATATCCTGA	HP1Hs alpha=25 kda chromosomal autoantigen [human,	S62077	3652
CCATCGTCCT			3653
TTGTAAATCG			3654
TTCTGTGTAT			3655
AAAAACATTC			3656
ACTGGTACGT			3657
TTTTTATCCA			3658
TTTGTTGCTT			3659
TTGGAACAAT			3660
TTTGGGGTTT			3661
TGCACTGAAT			3662
TGCAATAAGA			3663
AGGATATCCA			3664
TTTCTGTGTA			3665
TTGGGGTTTG			3666
TAGGGCTCTC			3667
TTTCCAAGAG	Human HF.12 gene mRNA.	X07290	3668
GACCAGCTGG	Human apM2 mRNA for GS2374 (unknown product specif	D45370	3669
TTTATGGGTT			3670
TTGTTTGTTT			3671
AGGCCTCCCC			3672

AGGCCTGGGC			3673
AGGCTGCCCA			3674
TTTGCGGCAG			3675
TTTGTTGACT			3676
TTTTCTTTAG	Human mRNA for KIAA0347 gene, complete cds.	AB0023	3677
TTTTGTATTT			3678
AGGGAGTGTC			3679
AGGGTTTCTC			3680
TTGTTGAAGC			3681
AGTGTGTTGC			3682
TTTCTGAAAA			3683
AAAGAAGCTC			3684
TGGACAAGTC			3685
TGGACATCAT			3686
ACTTAGGCTT			3687
TGGCAGCTTT			3688
TGCTTATTGA			3689
TGGCTGAGCA			3690
ACTTGATAAA			3691
ACTTTATTAG			3692
TGCTCTTTCC			3693
TGCTCAACAG			3694
TGTCAGAATT			3695
TGCATCTGGT	H.sapiens mRNA for BiP protein.	X87949	3696
TGCGTCACCG			3697
AGCCTCGGGC			3698
TGCCCTTCAG			3699
TCTTTTCAAA			3700
TGCCCTCAAG			3701
AGCCAGATCA			3702
TTCCAGATGG			3703
TTCATTACAC			3704
TGTGTTGAAA			3705
TGCCCTCAGC			3706
TGTTGTTGAG			3707
TTAGTCAGGT			3708
TTAGGTTGTC			3709
TTAGGAGGGT			3710
TTAGAGCCTA			3711
AAACGACCTC			3712
TTCTGCATCC			3713
AAAAGGTTAT			3714
TCATCATCAG			3715
TGAAGGGTAT			3716
GAAATGTAAG			3717

TGACTGTCAC			3718
AACCCAGGAG	Human clone 23618 mRNA sequence.	AF0071	3719
CGCACCATTG	GCN5-like 1=GCN5 homolog/putative regulator of tra	S82447	3720
TGAAAAGCTT	N8=tumor expression-enhanced gene [human, NCI H-69	S82081	3721
TCTCTACTCT			3722
TCCGTGGTTG	Homo sapiens neuronal tissue-enriched acidic prote	AF0396	3723
GTGGCGGGCG	Homo sapiens malignancy-associated protein mRNA, p	AF0414	3724
TATTTTGTTA	Homo sapiens cdc14 homolog mRNA, complete cds.	AF0003	3725
TGTCCTGGTT	Human wild-type p53 activated fragment-1 (WAF1) mR	U03106	3726
TATTTTCTTT	H.sapiens polyA site DNA sequence.	Z24749	3727
TTTCAGAGAG	Homo sapiens signal recognition particle subunit 9	U20998	3728
TGCCCTTCAA			3729
GTCTATGCCT			3730
TACTGGCCGC			3731
TATTTAAACA			3732
GCTTTTTAGA	Human non-histone chromosomal protein HMG-14 mRNA,	J02621	3733
TAGCTGTCTT			3734
ATTCTGTCAA			3735
TATCTGCCAA			3736
AAGAAGCAAG			3737
ATGGTTCTCA			3738
ATTACAGCCA			3739
ATTAACTTAT			3740
TCAGTACAGA			3741
TCAGTTCTTG			3742
ATGTCTTTTC	Human insulin-like growth factor binding protein 4	M62403	3743
TGCTGTGCAT	Homo sapiens dead box, X isoform (DBX) mRNA, alter	AF0009	3744
TCAGAAGTTT			3745
TCCTTGGACC	Human proline dehydrogenase/proline oxidase (PRODH	U82381	3746
ATTGATCAAT			3747
TTGTCCATAT			3748
TCTGCGCATC			3749
GGAGGCCGAG			3750
ATAAAACATT			3751
ATAATAAAAG	Human cytokine (GRO-gamma)	M36821	3752

	mRNA, complete cds.		
TTGCTTGAGC			3753
ATACTAGTGG			3754
TCTCCGTACA			3755
GGCCTGCTGC			3756
TTCCCTGTGT			3757
TTCCAGCTTA			3758
CACTACACGG	Human rapamycin- and FK506-binding protein, comple	M75099	3759
TGATCGCGGC			3760
ATCTGTTTAT			3761
TGGGCAGCTG			3762
TCATTATTTA			3763
TCATTTTGGA			3764
TGTCTCAAAA			3765
ACTCTAGACA			3766
TCTAGCATTT			3767
ATGAACTCCT			3768
TTCAGTGCTA			3769
TGTCTGGTTG			3770
ATCGTGCGCT			3771
ATCCAAATTT			3772
ATCATAGACG			3773
TTAAATCGTG			3774
TTGTTACATC	Human mRNA for phosphoribosypyrophosphate syntheta	D61391	3775
TCCCTTAAGC			3776
GCCCCAGCCA			3777
CACTGTGACC			3778
AAGCCCTACA			3779
GCCAGGGCCA			3780
CATAGCCTGG			3781
AATAAAGGTG			3782
CATCCCGTGA	Human leukotriene A-4 hydrolase mRNA, complete cds	J03459	3783
CAGGGTCCCC			3784
CATTTCAATA			3785
GCCCCAGCTG	Homo sapiens N-methyl-d-aspartate receptor (NR1-2)	L13267	3786
GAGCAAAGGA			3787
GAGCACCTCC			3788
CAGCTGCTCC			3789
CAGCACAGAC			3790
GCCGAGGAAA			3791
CAGTGGGTGG	Human mRNA for UDP-galactose transporter related i	D87989	3792

CCACTCTCAG			3793
ACACAAGTCG			3794
CCAGCAGAAG			3795
GCAACTGTGA			3796
GCAAGCCATC			3797
GCACAGGCCA			3798
GCCAGAACAG			3799
GCACCCAACA	Human prostate carcinoma tumor antigen (pcta-1) mR	L78132	3800
CACTGCCTTG			3801
CTTGGGATGT			3802
CCACCTTTCC			3803
CCACAGCTGT			3804
GCAGTGCCCA			3805
CCAATTTACA			3806
GAGAGAAAAT			3807
ACAATATCGA			3808
CTGCTGGAGG			3809
CACTGTGCCT			3810
ATGTTTTGCA			3811
ATGTTGCTGA			3812
GCACCCTCAG	Human RGP3 mRNA, complete cds.	U27655	3813
ATGGGGGGCA			3814
CAAAACAGGC			3815
ATGGCTAAGC			3816
TGGAACAGGA	H.sapiens mRNA for TGIF protein.	X89750	3817
CTGCTAAGGT			3818
GCAGAGATGG			3819
GCCAGCCCAT			3820
ACTGTATTTT			3821
GCCCATTGCT			3822
CAAGCCATCC			3823
GCGGGAGCGG	Human mRNA for KIAA0224 gene, complete cds.	D86977	3824
ACAGATGTTG	Human mRNA for proteasome subunit p42, complete cd	D78275	3825
CACTGCATAT	Human phosphorylase kinase (PSK-C3) mRNA, complete	M31606	3826
GCCGGCCTTT			3827
GCCTCAGTTC			3828
ACCTATAAGT			3829
CTGTCCGTAC			3830
ATTTCTGCTG			3831
GCCTCGGCCT	Homo sapiens putative DDB p127-associated protein	AF0359	3832
CCCACTGCAC			3833

CACCTGTCCT			3834
GGGACCCCGG	Human chloride channel protein (CLCN7) mRNA, parti	U88844	3835
CACAAGATGA			3836
GGGGCTGTGG	Human TFIIIC Box B-binding subunit mRNA, complete	U02619	3837
GAGGGAGTTC			3838
GCGAGACCCT			3839
GCCTCCGAGA			3840
GAATATGGCT			3841
CTTCTGTCTC			3842
CTCGTTAAGA			3843
CTCCCAGGTC	H.sapiens mRNA for M-phase phosphoprotein, mpp6.	X98263	3844
AAAGTCAGAA	Human cytochrome bc-1 complex core protein II mRNA	J04973	3845
AATAAAGTTG			3846
CTCTAGTCCA			3847
ACTCACGATT			3848
GACTGGAACT			3849
GAGAATCTGC			3850
CAAATGAGGA			3851
CAATGTGTTA	H.sapiens mRNA for NADH dehydrogenase.	X81900	3852
CTTTTGGTTT	Human p76 mRNA, complete cds.	U81006	3853
CATTAAAGGG			3854
TGCTGAATCA			3855
AAGTACTTCA			3856
GCCCGCAGGT			3857
CCCATCGTTC			3858
ACCAAATTAA	Homo sapiens TRAIL receptor 2 mRNA, complete cds.	AF0162	3859
ACATTTCCAA			3860
CTGCTGTCCC			3861
GACAACAGTC	H.sapiens (xscad) mRNA, 340bp.	Z36852	3862
GAGAAACCTT			3863
CTGCCTGGCA	Homo sapiens X-ray repair cross-complementing prot	AF0355	3864
GAAGCCAGGA			3865
GCCTGTTTGG	Homo sapiens phenol UDP-glucuronosyltransferase (U	J04093	3866
GCTGCACCGG			3867
GACGTAGCGG			3868
CTGAGGGCCG			3869
CTTGTGTGTA	Human mRNA for KIAA0059 gene, complete cds.	D31883	3870

GAATCATTTT			3871
CTGCTGCTGG			3872
GAGTTTTTAA			3873
CCCTCGGAAA			3874
GAGGGATTTC			3875
CCCTCATCCC			3876
GAAGAGGCCT			3877
GAGGGTATAC	Human mRNA for transcription factor TFE3 (partial)	X51330	3878
CCCGTCCGGG			3879
GAAAACATTC			3880
CCCTCTTTGG			3881
GAAGCAAAAA			3882
CCCATATTTT	Human L-isoaspartyl/D-aspartyl protein carboxyl me	M93008	3883
GATGACTTGC			3884
CCCATAATCC	Homo sapiens 15S-lipoxygenase mRNA, complete cds.	U78294	3885
GATGGTCAGT			3886
CTGGGACTGC			3887
CCCGGTGTGT			3888
CCTACAGATA			3889
GAATACCTTC			3890
GAAGCAATAA	Human RNA sequence of the human DS glycoprotein al	X00033	3891
CGGTTTGCAG			3892
CGGGAGCACC			3893
CCTCTGGAGG			3894
GGAGGGATCA	Homo sapiens mRNA fragment.	L10140	3895
TTGTCTGCCT			3896
GTGAAGTCTT	Homo sapiens clone 24551 mRNA sequence.	AF0550	3897
GAACAATTAC			3898
TACTTGTGTG	Homo sapiens clone 23742 mRNA, partial cds.	AF0352	3899
TAACAGCCAG	Homo sapiens MAD-3 mRNA encoding IkB-like activity	M69043	3900
CCGGACCTGT			3901
CCGCTGCACT			3902
GAAGAAAACA	H.sapiens mRNA for mitochondrial transcription ter	Y09615	3903
GAAAAAATGG			3904
GTCTTGAAGC			3905
AGGTGGGCAA			3906
AGTACGAATG			3907
AGGATGTACA	Homo sapiens DEME-6 mRNA, partial	AF0071	3908

	cds.		
GTTCCCTGGG			3909
GTTATAAGAT	Human deleted in split hand/split foot 1 (DSS1) mR	U41515	3910
GTGCAGGGAG			3911
GTCAGAACTT			3912
GGAGGAAGTG			3913
AGGGAAAAAA			3914
GGAGCAGGAC			3915
GCTGTAGTCC			3916
GGCCCAGGCC	Human aldehyde dehydrogenase mRNA, complete cds.	M77477	3917
GGAGCACTGT			3918
TTGGGGTTCC			3919
GCTTGTTCTC	Human mRNA for heparan sulfate proteaglycan (glypi	X54232	3920
ACATAAGATC			3921
GGCTTTGGTC			3922
GGCTTTGGTG			3923
GGACTTGGCC			3924
GGCTTTTTAG			3925
CGATCAGTTT			3926
GGGAGGGAAG	Human mRNA for KIAA9001 gene, complete cds.	D42040	3927
ACCTTTGCGA			3928
CCTTGTCCTC	H.sapiens mRNA for GM2 activator protein.	X62078	3929
AGGAAAAAAA			3930
AGTAACGTGT			3931
GGGCAGGGGA			3932
GCTGGGCTGG			3933
GACATATGTA	H.sapiens coxVIIb mRNA for cytochrome c oxidase su	Z14244	3934
GGAGAGTACA			3935
GGAGATGGAG			3936
ACTGGGGAAT			3937
CGCCGCCGGT			3938
GGACATCAAG			3939
TTTGTCTGTG			3940
TTTGTAGATG	Human HepG2 3' region MboI cDNA, clone hmd3c06m3.	D17196	3941
ACTGCTGAAC	Homo sapiens secretory carrier membrane protein (S	AF0050	3942
ACTTTGATGA			3943
GGCAGCGCCC			3944
TTGTGGGATC			3945

GCTTTGGGAT			3946
TTGGTGGAGG			3947
TTGCGTGCTG			3948
GCCGCTACTT			3949
TGGGGGCACC	Homo sapiens I-Rel mRNA, complete cds.	M83221	3950
GTCTTGAACT	Human asparagine synthetase mRNA, complete cds.	M27396	3951
TGGGCCCGTG			3952
AGACAATTTT	Human breast cancer cytosolic NADP(+)-dependent ma	U43944	3953
CGGTCTTATG	Human mRNA for serine/threonine protein kinase, co	D86550	3954
ACCTGGTGCC			3955
GGCACACCTT			3956
TGCCTGTAGT	Human primary Alu transcript.	U67823	3957
TCCCCATTAA			3958
TCATCTCCCT			3959
GGCCGTGTCC			3960
AGCACTTTTG	Human FEZ2 mRNA, partial cds.	U60061	3961
GGCCTGTGGA			3962
AGCCTGGGCC			3963
AGCTGGGATG			3964
GCTTGCTGGC			3965
CCTCTTTCAG			3966
CAGCATCCCC			3967
ATAGTCTGTT			3968
CTGAGGGTGG			3969
GGATTTGGGC			3970
CTAAAAGGAG	Human autoimmune antigen small nuclear ribonucleop	M15919	3971
AAGAATTTGA			3972
GCGGCTTTCC	Homo sapiens cDNA homologous to Yeast SCO1 & SCO2	AL0216	3973
ATATGATCAT	Human ADP-ribosylation factor-like protein 4 mRNA,	U73960	3974
GGGCTACGGA			3975
ATCACCCCCT			3976
ATGACACTCA			3977
ATCAGTGTGC			3978
CAGGGGCTGG			3979
AGGTGGCCAA			3980
TTTGGTCTTT			3981
GCCTTAAAAA			3982
GCTGTAATCC	Human clone 30849 defective mariner transposon Hsm	U92026	3983

ACTGACTATC	H.sapiens G9 gene encoding sialidase.	X78687	3984
ACCTGTATCC	Human 1-8U gene from interferon-inducible gene fam	X57352	3985
CTCACTTTTT	Human NF-IL6-beta protein mRNA, complete cds.	M83667	3986
ATGAATTAGC			3987
GGCACAATCA			3988
CCTCCGGCCA			3989
AAGGCCTCGG			3990
AAGAACCAAG	Human autonomously replicating sequence (ARS) mRNA	L08436	3991
ATGCCTATTT			3992
GCTGAGGGCT			3993
ATGCTTGCTT			3994
ATCGCACCAC			3995
ATAGAGGCAA	Human mRNA for KIAA0026 gene, complete cds.	D14812	3996
GGAGGCAGGG			3997
GGACCCTCTC	Human clone 23764 mRNA sequence.	AF0071	3998
AATAAAATTA	Human lymphotactin precursor mRNA, complete cds.	U23772	3999
CCTGGGTCCC	insulin receptor [human, familial insulin resistan	S70454	4000
GCTGGGATCA			4001
GGATTGGCCT			4002
GGAAGTGCCA			4003
ATACTGCTGC	Human CUL-2 (cul-2) mRNA, complete cds.	U83410	4004
AAGGAGTCCC			4005
GCTGAGAATA			4006
CCCTCAATCC	Human Liver mRNA for interferon-gamma inducing fac	D49950	4007
GCTCAGATCG			4008
CTATCAGGTA			4009
CAGTCCCCCT	Human mRNA for KIAA0153 gene, partial cds.	D63487	4010
CATTCCTCCT	H.sapiens mRNA for emerin.	X82434	4011
CAGGGGTGAC			4012
GGGAGCCGAG	Human mRNA for KIAA0169 gene, partial cds.	D79991	4013
GCTTATGTTA			4014
AAGACCTACA			4015
AAACGCGGCC			4016
AAGACTGAAG			4017
AAATAAAAAA			4018

GGCTCACTTT			4019
AACAGTGTGC			4020
AAAAGAAGTT			4021
AAAAGATACT			4022
AACAACAGTG			4023
AACGCGGGCC			4024
AAGCTCTGTG			4025
TTTTCTGAGT			4026
AAAATAAATT			4027
AAATGTGAAT			4028
AACCTGTTTT	Human alcohol dehydrogenase class III (ADH5) mRNA,	M29872	4029
AAATCAGGAA			4030
AAGTAGCTGG			4031
AAAACTGGCA			4032
AAGGTAGATG	Homo sapiens 5,10-methenyltetrahydrofolate synthet	L38928	4033
TTTGAACCCT			4034
TTTCTTTTTG			4035
AAATCCTGTG			4036
AAAACATTAA			4037
GGCCGGGTGG			4038
GGAGCTGTCT			4039
TGGTACTTCT			4040
GTGCAAAATG			4041
AACTGCGGCA			4042
TTCATCTCTT	Human pyruvate carboxylase precursor, mRNA, nuclea	U30891	4043
AAGAAATGCA			4044
TACCAAGACC	H.sapiens mRNA for beta-COP.	X82103	4045
TACGTCCACG			4046
TTATATTGCC			4047
TAGCAGAGGC			4048
TAGCCCCAGC	Human variant urokinase plasminogen activator rece	U09347	4049
TGTTACAGCC			4050
TCAACTGAAG			4051
AAGTTTATAG			4052
TGTGCTGAGA			4053
TTCCCAGGAG			4054
TCCCTGGCAT			4055
TCTGCACTGA			4056
TCTGTGCTCA			4057
AAGAACATTG	H.sapiens mRNA for ATP-citrate lyase.	X64330	4058
AATATGGGTG	Human tetratricopeptide repeat protein (tpr2) mRNA	U46571	4059

TGGGTGAGCC	Homo sapiens cathepsin B mRNA, complete cds.	L16510	4060
AATATGGTAC			4061
TGAGCAAGCC			4062
TGCACACACA	Homo sapiens (clone KT4) bone morphogenetic protei	L35278	4063
TGCACCTTGG	Human cdc2-related protein kinase mRNA, complete c	M68520	4064
TGCTCTCTCT			4065
TGGAGAGTCG			4066
TCATTTTTTT			4067
AAGTGGCAAG			4068
TTGGTCCCTC			4069
TTGGTAAATG			4070
GGGCATCTCT	Human mRNA for histocompatibility antigen HLA-DR (	V00523	4071
TTGGGGTTCT			4072
AAGATGGCCC	Human mRNA for non-erythropoietic porphobilinogen	X04808	4073
GGTGCTCCCT			4074
AAGTGGAGGA			4075
AACGTGCCAG			4076
GGTGGTTGCT			4077
TTGACCAGGC	Human protease-activated receptor 3 (PAR3) mRNA, c	U92971	4078
TTGAAGAAAA			4079
GTTTGCAAGT			4080
TCTGACCACC			4081
TTTCACTCCT			4082
GTGGCCTACT			4083
AAGTGGCTGG			4084
GTGGCGCACG			4085
GTGGGGGGAG			4086
GTTATTGAGG			4087
AAGCCGGCCC			4088
GTTGTAAATA			4089
AAGTTGAATT			4090
AACTCCCGTG	H.sapiens (xs163) mRNA, 390bp.	Z36815	4091
GTTGTGAAGA			4092
GTTTAGAGGG			4093
TTCTAACATA	Human mRNA for Na/K-ATPase beta subunit.	X03747	4094
TTCTTTTCAT	Human protein synthesis factor (eIF-4C) mRNA, comp	L18960	4095
CTCAACAGCA	Human translation initiation factor 3 47 kDa subun	U94855	4096

GGCCCGGCTT			4097
TAGACTTATT	Human mitochondrial aspartate aminotransferase mRN	M22632	4098
GTTGGGAAGA			4099
GGTGTGAGCC	Human INS-1 winged-helix homolog mRNA, complete cd	U83113	4100
GGCCAGGTGG	Human mRNA for KIAA0047 gene, partial cds.	D38554	4101
GCTAAGACTT			4102
AATAGCTCAG			4103
GAAGGAAGAA	Human cyclin-dependent protein kinase mRNA, comple	U79269	4104
AGGCCAAGGG			4105
ATTGGCTGGG	protein phosphatase 2C alpha [human, teratocarcino	S87759	4106
ATTCCAATCT	Human mRNA for KIAA0034 gene, complete cds.	D21260	4107
ATCCGGGGAG	Homo sapiens RCL (Rcl) mRNA, complete cds.	AF0401	4108
AAATACAGCA			4109
TGTTAATGTT			4110
AAGAAGCAGG			4111
GATCACAGTT	Human mRNA for lactate dehydrogenase B (LDH-B).	Y00711	4112
TAGTTGAAGT	Human mitochondrial ubiquinone-binding protein mRN	M22348	4113
AGCACTGCAG			4114
AAAAAGCAGA	Human superoxide dismutase (SOD-1) mRNA, complete	K00065	4115
TTTACAGCTG	Human diacylglycerol kinase zeta mRNA, alternative	U94905	4116
TTACTAAATG			4117
TTAATAGTGG			4118
TGTGTTGTCA	Human mRNA for NAD-dependent methylene tetrahydrof	X16396	4119
TCAGTTTGGA	Human palmitoyl protein thioesterase mRNA, complet	U44772	4120
TCTCTGCAAA			4121
GCCAAGGGCC			4122
GTGGTGGGCG			4123
CCACCTAATT			4124
CAACATTCCT	Human D-dopachrome tautomerase mRNA, complete cds.	U49785	4125
ATTGTGAGGG			4126
ATTCAGCACC			4127
ATGGCAGGAG			4128
TGCTGCTTGA			4129

GGGGTCAGGG			4130
TCAGAAGGTG			4131
ACGGCTCCGA			4132
TTGCTAGAGG			4133
TTATGGGGAG	Human transformation-sensitive protein (IEF SSP 35	M86752	4134
TGGTGCAGCA			4135
TGCCATCTGT			4136
GCACCTAATT			4137
GTTTAAATCG	Human mRNA for proteasome subunit HC3.	D00760	4138
TCAAATGCAT	Human nuclear ribonucleoprotein particle (hnRNP) C	M16342	4139
GAAGGCATCC	Human immunodeficiency virus tat transactivator bi	M34079	4140
CAAGTTAGTG			4141
ACTACAAATA			4142
AACTAATACT			4143
TAAGTGGAAT			4144
GGGCTCACCT			4145
TACCAGTGTA	Human mitochondrial matrix protein P1 (nuclear enc	M22382	4146
AAGAGTTACG			4147
GAATCCAACT			4148
CTTGAGCAAT	Human immunophilin (FKBP52) mRNA, complete cds.	M88279	4149
CTCATAGCAG			4150
CGCTGTGTGC	Human mRNA for alternative splicing product of glu	D13287	4151
CCTGTAATCT	Human epidermal growth factor receptor (HER3) mRNA	M34309	4152
CCGGCGCGTG			4153
CCGTCATCCT	H.sapiens mRNA for Not56-like protein.	Y09022	4154
ACTGGCGAAG	Human hLON ATP-dependent protease mRNA, nuclear ge	U02389	4155
ACAGTCTTGC			4156
TGATGTTTGA	Human mRNA for KIAA0058 gene, complete cds.	D31767	4157
CTTCTGCTGG			4158
ACCTTGTGCC	Human L-iditol-2 dehydrogenase mRNA, complete cds.	L29008	4159
TTTTGGGGGC			4160
TTTCTGTATG			4161
TCACAGCTGT			4162
ATTATTTTTC	Human ribosomal protein L7 (RPL7)	L16558	4163

	mRNA, complete c		
CTGTGAGCCA			4164
TTCCTCCACC			4165
GTGGACCCTG			4166
GGTAGCTCAG			4167
GGGCGGGGGC	Human DNA polymerase delta mRNA, complete cds.	M81735	4168
GGCCCTCTGA	Human peptidyl-prolyl isomerase and essential mito	U49070	4169
GCCTTGGCCC			4170
GTTGTGGCCA			4171
GCACAAGAAG			4172
TCTCCCTTCA			4173
CAGCCTCCCT	Human uroporphyrinogen III synthase mRNA, complete	J03824	4174
CAGAAGAGGC	H.sapiens mRNA for DGCR6 protein.	X96484	4175
AGCCACTGCG			4176
AAAGTTCTCA			4177
TTTTGAAGCA	H.sapiens GENX-5624 mRNA, 3' UTR.	X81895	4178
AAACACTCTT	H.sapiens OXA1Hs mRNA.	X80695	4179
GCCCGAGGAA			4180
GCGCAGACTT			4181
TGCCAGCGCC			4182
TTGTGGGGGG			4183
TGGGCGCCTT	Human uroporphyrinogen decarboxylase mRNA, complet	M14016	4184
TCATTGTAAT			4185
TACTAAAAAA			4186
GTGGCGGGTG			4187
GTGGTGGCAG			4188
GCTGGTCTGA			4189
TGATAATTCA			4190
GCAAAGAAAA	Human breast tumor autoantigen mRNA, complete sequ	U24576	4191
GAGAGCTACA	Human electron transfer flavoprotein alpha-subunit	J04058	4192
ATTATCCTGG			4193
ATAAATTGGG	H.sapiens mRNA for H+-ATP synthase subunit b.	X60221	4194
TTTCAGATTG	Human transcriptional coactivator PC4 mRNA, comple	U12979	4195
TTCATTTGCC			4196
GTGGCACACA	Human cortex mRNA containing an Alu repetitive ele	X51524	4197
CTGGGCAAAC			4198
TTTTACTGGG			4199

TGGGCCTGGC			4200
TGCCTGTAAT	Human NTera2D1 cell line mRNA containing L1 retrop	U61090	4201
TCTTGTAACT			4202
TCTGTAATCC	Human phenol-sulfating phenol sulfotransferase mRN	L19999	4203
GGAATAAATT	Human mRNA for cytochrome c1.	X06994	4204
AACGAGGAAT			4205
GACTCTCTGT	Human gamma-tubulin mRNA, complete cds.	M61764	4206
ACATCGTAGG			4207
CTGGATGCCG	Human RD protein (RD) mRNA, complete cds.	L03411	4208
CCCCCTGGGA			4209
CACCCCCAGG	Human Gps2 (GPS2) mRNA, complete cds.	U28963	4210
ATGGGCTGGT			4211
AGGTCCCTGT			4212
AGAGCCCTAG	Homo sapiens COX17 mRNA, complete cds.	L77701	4213
GCCACTACCC			4214
GATCTTCGTA			4215
TCCATCTGTT	Human mRNA for ryudocan core protein.	D13292	4216
GTGGGGTGAC			4217
GGTTTGTGTG			4218
GGAGGCAGGT			4219
GCTGGAGCTA	Human dihydrolipoamide dehydrogenase mRNA, complet	J03620	4220
GCCTCTTCCC			4221
TTTCTTAAAG	Human mRNA for KIAA0324 gene, partial cds.	AB0023	4222
GCCAAAAAAA	H.sapiens (TL7) mRNA from LNCaP cell line.	X75687	4223
GACTGCGTGC	Homo sapiens cell cycle progression 2 protein (CPR	AF0117	4224
GACTCAGGGA			4225
CTGCCAAGTT	H.sapiens mRNA for zyxin 2.	X95735	4226
ATATTTTCCT			4227
ACTAACTGTG	H.sapiens RbAp48 mRNA encoding retinoblastoma bind	X74262	4228
ACCTGAAACC			4229
ACCGTATTCC			4230
GCCAAACGTA			4231
CGGTTACTGT			4232
CAGCGCGCCC			4233

AATCTGCGCC	Human interferon-induced 17-kDa/15-kDa protein mRN	M13755	4234
GGGGACTGAA	Homo sapiens mRNA for low molecular mass ubiquinon	D50369	4235
TTAAAAGCCT	H.sapiens ckshs1 mRNA for Cks1 protein homologue.	X54941	4236
GGCTGGTCTG			4237
GACTCTGGTG			4238
TGTGGGTGCT	H.sapiens mRNA for E-cadherin.	Z13009	4239
AACCCGGGAG	Human primary Alu transcript.	U67828	4240
AGTGCAAGAC			4241
TCAGCCTTCT			4242
TTGGAGATCT	Human NADH:ubiquinone oxidoreductase MLRQ subunit	U94586	4243
ACAACTCAAT	Human HepG2 3' region cDNA, clone hmd4h10.	D16936	4244
TTACCTCCTT			4245
GCAGGGCCTC	H.sapiens mRNA for MAT8 protein.	X93036	4246
GGAAGGGAGG			4247
AAGATCCCCG			4248
TGGTGACAGT			4249
ACTGAGGTGC	Homo sapiens FGF-1 intracellular binding protein (	AF0101	4250
GCTTTCTCAC			4251
GATGACCCCC			4252
GACCAGAAAA	Human COX VIa-L mRNA for cytochrome c oxidase live	X15341	4253
CCATTGCACT	Human phosphatidylinositol 3-kinase homolog (ATM)	U26455	4254
ATCGGGCCCG			4255
CTGCTATACG	Human ribosomal L5 protein mRNA, partial cds.	U76609	4256
ACCTCAGGAA	Human high density lipoprotein binding protein (HB	M64098	4257
AATGCAGGCA	Human S-adenosylhomocysteine hydrolase (AHCY) mRNA	M61832	4258
TGGGGAGAGG			4259
GGAACTGTGA	Homo sapiens Tspan-1 mRNA, complete cds.	AF0548	4260
GGAAAAGTGG	Human HepG2 3' region Mbol cDNA, clone hmd3e05m3.	D17206	4261
ATCAGTGGCT	prosome beta-subunit=multicatalytic proteinase com	S71381	4262
GTGCTGGAGA	Human SnRNP core protein Sm D2 mRNA, complete cds.	U15008	4263
GGGAGCCCCT	H.sapiens mRNA for arrestin (partial).	Z11501	4264
GCAGTGCCAC			4265

GGGCTGGGGT	Human cell surface heparin binding protein HIP mRN	U49083	4266
CGCCGCGGTG			4267
TAAGGAGCTG	H.sapiens mRNA for ribosomal protein S26.	X69654	4268
ATTCTCCAGT	Human mRNA for ribosomal protein L17.	X52839	4269
AAGGAGATGG	H.sapiens mRNA for ribosomal protein L31.	X69181	4270
ATAATTCTTT	Homo sapiens (clone cori-1cl5) S29 ribosomal prote	L31610	4271
TGCAGCGCCT	H.sapiens mRNA for uridine phosphorylase.	X90858	4272
TCCCATTAAG			4273
GTGAAGGCAG	Human v-fos transformation effector protein (Fte-1	M84711	4274
CAATAAATGT	Homo sapiens ribosomal protein L37 mRNA, complete	L11567	4275
TAGGTTGTCT	Homo sapiens (clone 04) translationally controlled	L13806	4276
CACAAACGGT	Human ribosomal protein S27 mRNA, complete cds.	U57847	4277
TACCATCAAT	Human glyceraldehyde-3-phosphate dehydrogenase (GA	M33197	4278
TTGGTCCTCT	Homo sapiens ribosomal protein L41 mRNA, complete	AF0268	4279
TTCATACACC			4280
TCCCTATTAA			4281
TGCACGTTTT	Human mRNA from chromosome 15 gene with homology t	K03002	4282
CCTATTTACT	Human cytochrome c oxidase subunit IV (COX4) mRNA,	M34600	4283
AGTATCTGGG	Homo sapiens Arp2/3 protein complex subunit p41-Ar	AF0060	4284
TAGCTCTATG	Human Na,K-ATPase alpha-1 subunit mRNA, complete c	U16798	4285
CTGTTGATTG	Human clone C4E 3.2 (CAC)n/(GTG)n repeat-containin	U00947	4286
CCCGACGTGC			4287
GCATAGGCTG	P43=mitochondrial elongation factor homolog [human	S75463	4288
TGTGATCAGA			4289
TAATAAAGGT			4290
CAATAAACTG			4291
GAAGTGTGTC			4292
CACTTGCCCT	branchio-oto-renal syndrome candidate gene {3' reg	S82655	4293

CCCCATCGTC			4294
ACAAACTGTG			4295
GACTCACTTT	Human secreted cyclophilin-like protein (SCYLP) mR	M63573	4296
TGGAGTGGAG	Human guanylate kinase (GUK1) mRNA, complete cds.	L76200	4297
GCATAATAGG	H.sapiens mRNA for large subunit of ribosomal prot	X89401	4298
GAGGGCCGGT			4299
GCTGCTCCCT			4300
GAAGATGTGT			4301
TCTGTCAAGA	transcript ch21=oligomycin sensitivity conferral p	S77356	4302
GTTGGTCTGT			4303
CTGCCGAGCT	Human cyclin-selective ubiquitin carrier protein m	U73379	4304
AGATCGAGAC			4305
TGCTTCATCT			4306
ATGAAACCCC	Human small cytoplasmic Alu transcript.	U67806	4307
GGAAGGGGGA			4308
CACAGAGTCC	Human alpha-2-macroglobulin receptor-associated pr	M63959	4309
CCAGGGGAGA	H.sapiens p27 mRNA.	X67325	4310
TGTGGGAAAT	Human mRNA for antileukoprotease (ALP) from cervix	X04470	4311
TCCCTATAAG			4312
TAGACTAGCA	Human globin gene.	M69023	4313
GTGTGTGGTG	Human clone 23856 unknown mRNA, partial cds.	AF0071	4314
GCCCATCGTC			4315
TCCCGTACAT			4316
GTGCTCTGTA			4317
ATGAGCTATG			4318
CCCTGATTTT	Human translation repressor NAT1 mRNA, complete cd	U76111	4319
CCCTATTAAG			4320
CCCAGACTCC			4321
CACCTTCCAG	Human melanoma antigen p15 mRNA, complete cds.	U19796	4322
TTCTCTCAAC			4323
ATCACAGTGT	Human nuclear-encoded mitochondrial serine hydroxy	L11932	4324
GTGGTGTGCA			4325
GGCTCCTCGA	Homo sapiens tapasin (NGS-17) mRNA, complete cds.	AF0297	4326

GTGCCTAGGG			4327
GAGAAACCCC	Human small cytoplasmic Alu transcript.	U67802	4328
AGCTGGAGTC			4329
AAAGTCTAGA	Human bcl-1 mRNA, complete CDS.	M73554	4330
GTAGGGGTAA			4331
GCGGGAGGGC			4332
GTTTTTCATT			4333
CCACAGGAGA			4334
CCCTGCCTTG	Human mRNA for neurite outgrowth-promoting protein	X55110	4335
CCATTGAAAC	Homo sapiens mRNA for Laminin-5 beta3 chain, compl	D37766	4336
TCCTCAAGAT	Human mRNA for human protein homologous to DROER p	D85758	4337
TCCTATTAAG			4338
CAGGAACGGG	Homosapiens ERK activator kinase (MEK2) mRNA.	L11285	4339
CAAGGATCTA			4340
ATGATGCGGT	cytoplasmic antiproteinase=38 kda intracellular se	S69272	4341
GAGCGGGATG	Human mRNA for proteasome subunit Y, complete cds.	D29012	4342
GGGTCAAAAG			4343
ACTTTGAATG			4344
GCCCGCCTTG	Homo sapiens (clone mf.18) RNA polymerase II mRNA,	L37127	4345
CCCGCCTCTT			4346
GCTTTGATGA	Human epoxide hydrolase mRNA, complete cds.	J03518	4347
CGGACTCACT			4348
GGAAGCACGG	Human antisecretory factor-1 mRNA, complete cds.	U24704	4349
AGTCTGATGT			4350
TGGCTAGTGT	Human mRNA for proteasome subunit z, complete cds.	D38048	4351
ACTCAGAAGA			4352
GCCAGGGCGG			4353
GAATTAACAT	Human 14-3-3 epsilon mRNA, complete cds.	U54778	4354
TCTGCCTGGG			4355
GCTCTCTATG	H.sapiens mRNA translocon-associated protein delta	Z69043	4356
CTGGGTCTCC	H.sapiens BBC1 mRNA.	X64707	4357
GAAATGATGA	Human mRNA for c-myc binding protein, complete cds	D89667	4358
TTAGCAATAA			4359

GGAGCGTGGG			4360
TTCTGGCTGC	Human mRNA for core I protein, complete cds.	D26485	4361
GTTCTCCCAC			4362
GTAATCCTGC			4363
GGAAAAAAAA	Human (clone SF2) hepatacyte growth factor (HGF) m	M73240	4364
TTTCAGGGGA			4365
TATCACTCTG	Homo sapiens male-enhanced antigen (Mea) mRNA, com	L10400	4366
AGCTGTCCCC			4367
TTGGTCAGGC	Human melanoma antigen recognized by T-cells (MART	U06452	4368
GCATATTAAA	Human mRNA for XP-C repair complementing protein (	D21090	4369
CTGCTCATCC	Human aldehyde dehydrogenase ALDH7 mRNA, complete	U10868	4370
GTGTAAATGG			4371
GGGGCCCCCA	Homo sapiens copper chaperone for superoxide dismu	AF0022	4372
GGGAGGAGGG			4373
GGGACGAGTG	H.sapiens (TL27) mRNA from (PC3) cell line.	X75684	4374
GGCCCTGGTG	Homo sapiens mRNA for HsGAK, complete cds.	D88435	4375
TCTGCACATC			4376
GCTGGGGGAC	Human gamma-glutmyl transpeptidase-related protein	M64099	4377
ATGGCCTGTA			4378
GCAGAGGCCT			4379
GAGTAGAGGC	H.sapiens mRNA for sphingomyelinase.	X59960	4380
GAGGTGCTCT			4381
GAGGCCTCAG			4382
GACCAGCCTT			4383
AAATCCTAGA			4384
GGAGTAAGGG			4385
TGTGTCAAAG			4386
ACCTGCCCCT			4387
AAAACAGTGG			4388
TTTTATGGAA			4389
TTTTACAGTA			4390
TTGTACAACA			4391
TTGCTAAAGG			4392
TCGTTGTTTA			4393
TTAGCTTGTT			4394

CGGATCTGCT			4395
TGGTAGTTAC			4396
TGGGCTGGGG			4397
TGGCCCGACG	Human mRNA for 8-oxo-dGTPase, complete cds.	D16581	4398
TGGATAATTC			4399
AATATTGTGG			4400
TGATGCTACC			4401
TTCCTCGGGC			4402
ACGACGGCCG			4403
CTTGGTGCTG			4404
AGCCGGGATG	LMP2=proteasome LMP2.s {alternatively spliced} [hu	S75169	4405
AGATGCCCTT			4406
AGAGTCCTGC			4407
AGACCATATT	Homo sapiens sin3 associated polypeptide p18 (SAP1	U96915	4408
ACTTAAGGAA			4409
AGGCCATAGG			4410
ACTCAAAGAC	Human C/EBP gamma mRNA, complete cds.	U20240	4411
AGGCCCCACG			4412
ACCTTTACTG			4413
ACCATTGGAT	H.sapiens mRNA for interferon-induced 17kDa membra	X84958	4414
AAGTGGAAGC			4415
AACATAAATT			4416
AACAGACACA			4417
AAAGTGAAGA			4418
ACTCAGACCA			4419
CACCGGGTAG	Human mRNA for KIAA0221 gene, complete cds.	D86988	4420
CGCCTTTACT			4421
CCTTTTTGTC			4422
CCTCTTCAGG			4423
CCGCCCCCAG	Human islet cell autoantigen ICAp69 mRNA, complete	U38260	4424
CCCCCCTGGA			4425
CCCCCAGTTG			4426
AGCTGGAAAG			4427
CACCTTAATT			4428
AACAAGGTGA			4429
CAATGTCTCA			4430
CAATGCTGCC			4431
ATTGTGAGGC			4432
ATAATTGACT			4433

AGGTCTGCCA	chlordecone reductase homolog {clone HAKRc} [human	S68290	4434
AGGCCTCGGC			4435
CAGTGGGGTT			4436
CCGGTTGGCA			4437
CCAGGCACGC	Homo sapiens XAP-5 mRNA, complete cds.	AD0015	4438
CGTGTTGTTC			4439
CGTGGGGTGG			4440
CGCCAGGCGG			4441
CGACGCTTGA			4442
CGACCGTGGC			4443
CTTTGCTGTG	Human mRNA for KIAA0045 gene, complete cds.	D28476	4444
CCGTCCCAAG			4445
GAAATTTAAA	Human mRNA for HMG-1, complete cds.	D63874	4446
CCGAGCAACT			4447
CCCTGTAATA			4448
CCCTGGGCTT			4449
CCCGTCGTCC			4450
CCCCAGCCCA			4451
AAAACTTAGA	Human mRNA for CD59, an LY-6-like protein regulati	X16447	4452
CCTTTCACAC	Homo sapiens general transcription factor 2-I (GTF	AF0357	4453
GATGGCTGGT			4454
GCTGGCTGTT	Human phosphatidylinositol (4,5)bisphosphate 5-pho	U45973	4455
GCGGGCGCGG	Homo sapiens TTF-I interacting peptide 20 mRNA, pa	AF0005	4456
GCGCTGGTAC			4457
GCGACGGCCG			4458
GCCTGGTGAC	Homo sapiens Fas-binding protein Daxx mRNA, comple	AF0159	4459
GCCCTTCCTG			4460
CTTCCCACTG			4461
GCCACCAGAC			4462
CCAGGATATT			4463
GAGGTGGTGC			4464
GAGAGCCTGC			4465
GAGAAGCCCA			4466
GACGACTGAC			4467
GACATCCCGC			4468
GAAGTTATAA	Homo sapiens clone 23915 mRNA sequence.	AF0381	4469

GCCCCTGAAG			4470
AATAGGGTCA			4471
CCCAAACGTG			4472
AGAAATGTAT	Human mRNA for transcription factor AREB6, complet	D15050	4473
ACTGTGGCGG			4474
ACTGGAGTTT	Human poly(A) polymerase mRNA, 3' UTR.	AF0029	4475
ACTGATCTGC			4476
ACTCTTCTAA			4477
AGATTTTCTC	Human fumarylacetoacetate hydrolase mRNA, complete	M55150	4478
ACCCCCTTCC			4479
AGCATATCTT			4480
AATAAAGCAA			4481
AAGTTGGAGG			4482
AAGCGAATGC			4483
AAGATTGGGG	CD44=CD44SP {alternatively spliced} [human, breast	S66400	4484
AACTCCCAGT			4485
AACCTCGAGT			4486
ACGCAGGCGC	Human nucleosome assembly protein 2 mRNA, complete	U77456	4487
ATGTACTAAA	H.sapiens mRNA for TFG protein.	Y07968	4488
CCACACAAGC			4489
CATAAAGTTT			4490
CAGGGAGCGC	Homo sapiens TPA inducible protein mRNA, complete	AF0561	4491
CAGATGAGAT			4492
CACTGCCTTT	Homo sapiens fb19 mRNA.	Y13247	4493
CACAGCGCCC			4494
AGACTTGGCA	Homo sapiens actin-related protein Arp3 (ARP3) mRN	AF0060	4495
ATGTGGTTGT	Human replication factor C, 37-kDa subunit mRNA, c	M87339	4496
TTTTATCTGG	H.sapiens mRNA for ITBA2 protein.	X92896	4497
ATGGCGGGTG			4498
ATGCTAAAAA			4499
AGTAACTGAG			4500
AGCTGGTTTC	Homo sapiens Pig8 (PIG8) mRNA, complete cds.	AF0103	4501
AGCTCGTACA			4502
AGCCACCGTG			4503
CAAAGGCTGT			4504
CACAGGCAAA	Human mRNA for KIAA0005 gene, complete cds.	D13630	4505

AGCCACTGTG			4506
GCAAAACCCT	Human clone 11 Alu repeat sequence.	U02053	4507
GATTTGAGAA			4508
GATGGCTGCC			4509
GAGGTGCCGG			4510
GACAGTGACG	Human mRNA for zinc finger protein, complete cds.	D45213	4511
GGGAAGGCAC			4512
CCCATCGCCC			4513
GGGACGGGTG	Human primary Alu transcript.	U67812	4514
CAAATAAAAA	Homo sapiens (clone CD18) tumor necrosis factor re	L04270	4515
ATTTGAGCAG			4516
ATGGCGATCT			4517
AGTGCCGTGT	Human p78 protein mRNA, complete cds.	M33882	4518
AGGGTTGGAA			4519
AAACCTGGGA			4520
CTGCTTAAGG			4521
TTTCCAGTGG	Human WD repeat protein HAN11 mRNA, complete cds.	U94747	4522
ATCTTGAACA			4523
AGTAGGAGGG			4524
AGGAAAAGAT	Human 1.1 kb mRNA upregulated in retinoic acid tre	U09196	4525
AGCTATTCCT	Human multiple exostoses type II protein EXT2.I mR	U72263	4526
AAGGGCAGTG			4527
AACCAGAGGT			4528
GCCACGTGGA	Homo sapiens mRNA for villin-like protein, complet	D88154	4529
TTTTTAATGT	Human H3.3 histone class C mRNA, complete cds.	M11353	4530
ACCACAGGGG			4531
TGCTGCCTGT	Human mRNA for BST-2, complete cds.	D28137	4532
TAAAGCTGTT	H.sapiens mRNA for E2 protein.	X53251	4533
GTGTGGGGTG			4534
GTGGTGGGCA	MJD1=MJD1 protein {CAG repeats} [human, brain, mRN	S75313	4535
GTGAAACCTG	Human Krit1 mRNA, complete cds.	U90268	4536
GTAGCGCGCC			4537
AAAGGTTGGT	Human GT335 mRNA, complete cds.	U53003	4538
CCAGCCTGGG			4539
AGGGCTACGG			4540
CTTTTTGTGC			4541

CTTCTGTGTA	Homo sapiens immunophilin homolog ARA9 mRNA, compl	U78521	4542
CTCTTCAGGA	Homo sapiens phosphomevalonate kinase mRNA, comple	L77213	4543
CTCTCAATGG	H.sapiens mRNA for GlcNac-1-P transferase.	Z82022	4544
CCCAATTTTC			4545
GATGGAATGT			4546
CCATAATGTT			4547
GCAAAAAAAT			4548
CCACTGCATT	H.sapiens INE1 mRNA.	Y10696	4549
CAGGCCTGGC			4550
CAATCACAAA			4551
CAAGAGCGAG			4552
ATGTTGCCCC	Homo sapiens HMG box containing protein 1 mRNA, co	AF0192	4553
ATGTTAGGGA	Homo sapiens vesicle soluble NSF attachment protei	AF0358	4554
CCCAAGGTGT			4555
TAAACTGTTT			4556
ACACTGCACT			4557
AAACTGTGGT			4558
AAACCTCTTC			4559
TTTCCAATCT	Homo sapiens vascular endothelial growth factor (V	AF0247	4560
TTGAATTCTT			4561
TTACTTATAC			4562
GACATAAATC	Human mRNA for KIAA0113 gene, partial cds.	D30755	4563
TACAAACCTG			4564
CACTTGAAAA			4565
GTGAGCAAGA	Human mRNA for a presumptive KDEL receptor.	X55885	4566
GGGGCTGGGG			4567
GGGATTTGGC			4568
GGCACAGTAA			4569
GCTTTCTCAA			4570
GCTTTCATTG			4571
TGCACCACAG			4572
CCGAGTTTTT			4573
ATGCGGAGTC			4574
GCTGCCAGCT			4575
GCTAAAAAAA			4576
GATCTCATCT			4577
GAGACCTTGG	Human betaB3 crystallin mRNA, partial cds.	U71216	4578

GAAGATGCCT	Human mRNA for UDP-galactose translocator, complet	D84454	4579
GGATCCTTGG			4580
CCTGTAGTTC			4581
GGGCTTTACC			4582
CCCTGGCAAT			4583
CCCAGATGAT			4584
CCAGATTTTG	Human mRNA for KIAA0253 gene, partial cds.	D87442	4585
CCACTGCCCT			4586
CAGCCTGTCG			4587
CAGCCAGGGG			4588
CTGGGTGCCC			4589
TCCCCGTAAA			4590
GCTTAGAAGT			4591
TTGTCCAGGC			4592
TTGCAATGCA			4593
TTACACCTGT	H.sapiens mRNA for caltractin.	X72964	4594
TGGATTTTGG	Human mRNA for A-raf-1 oncogene.	X04790	4595
TGGAACTGTG			4596
GGAGAAGATG			4597
TCTATAGAGT			4598
AGTTTGGGCT			4599
TATTTATGGA	H.sapiens RON mRNA for tyrosine kinase.	X70040	4600
TATCCTGGCT			4601
TAATTTTGGA			4602
GTGTGAATGT	Human 150 kDa oxygen-regulated protein ORP150 mRNA	U65785	4603
GGTGGTACAC			4604
GGTAGCAGGG			4605
TGAGGCAGGG	Human syntaxin 5 mRNA, complete cds.	U26648	4606
CTGCCCCCAC			4607
GGGCCCTTCC	Homo sapiens clone 24684 mRNA sequence.	AF0550	4608
GGGCCCTGGC	Human k6h6 mRNA for lambda-immunoglobulin light ch	X13080	4609
GGCCAAACAG			4610
GGCATTTTAA			4611
GCGGCCATCC			4612
GCAATGCAAA			4613
CAGCAGTAGC	H.sapiens mRNA for 218kD Mi-2 protein.	X86691	4614
GACTTCACTT			4615
TACTATTAAT			4616

CTCAGCCTGA	Human HepG2 3' region MboI cDNA, clone hmd2f10m3.	D17172	4617
CGTGTCAGCA	Homo sapiens brain and reproductive organ-expresse	L38616	4618
CCTTAGCTGG			4619
CCTGGAGCAA			4620
CCCCTGGATC			4621
AAACATTGGG	Human HepG2 3' region MboI cDNA, clone hmd4f06m3.	D17237	4622
GAGTCAGGAG			4623
TTCTCACCAC	Human myosin light chain 1 slow a (MLC1sa) mRNA, c	M31211	4624
ATTACAAACC			4625
ACTGCTCATT			4626
ACATCCCAGA	H.sapiens polyA site DNA.	Z24726	4627
ACAAGGTGCG			4628
ACAAAAAAAA			4629
AATTCAATTA			4630
TACACTGCTT			4631
TTTCTGCTCC			4632
TACCCTAGAA	Human estrogen receptor-related protein (variant E	M69297	4633
TGGGCCCCAC			4634
TGCTGCCTCA	Homo sapiens hook2 protein (HOOK2) mRNA, complete	AF0449	4635
TCTTTCCCCA			4636
TCAGGGAGAT			4637
TATGTATGTT			4638
TATCCATACC	Human mRNA for hydrogen carrier protein, a compone	D00723	4639
ATCTCTATCC			4640
TTTGGAAATC			4641
GATTCCGTGA			4642
GCAATCCACA			4643
GCAACTCGTT			4644
GCAACACCCC			4645
GCAAAACCGT			4646
GATTTGGAGA			4647
GATTTCAGCT			4648
GATTGTGCAA	Human mRNA for KIAA0183 gene, partial cds.	D80005	4649
GCCCCCTGGA			4650
GATTGCTGGA	Human dihydropteridine reductase (hDHPR) mRNA, com	M16447	4651
GCACCACTGC			4652
GATTCAATAA			4653

GATTAGCACC			4654
GATTACCTGT			4655
GATGTTGGGG			4656
GATGTGAAAT			4657
GATGTCATCA	H.sapiens XG mRNA (clone R4(607)).	Z48515	4658
GATGGCCAGG			4659
GATTGGCTGG			4660
GCATCTGTTT			4661
CATTTTCAAG			4662
GCCCCCCCAC			4663
GCCCACTGTA			4664
GCCACTGCAC			4665
GCCAAGGGGT	ArgRS=arginyl-tRNA synthetase [human, ataxia-telan	S80343	4666
GCCAAATTAG			4667
GCATTGTGGT			4668
GCAATGAGGT	Human mRNA for KIAA0176 gene, partial cds.	D79998	4669
GCATCTTCAA	Human lymphocyte dihydropyrimidine dehydrogenase m	U20938	4670
GCACAGAGCC			4671
GCATCAAGTT			4672
GCAGTCGCCA			4673
GCAGCTCGCT			4674
GCAGCGCGCC	Human G protein-coupled receptor mRNA, complete cd	U35398	4675
GCAGCCCTAC			4676
GCACTTACCA			4677
GCACCCAAGG			4678
GATCTGTTCC			4679
GCATTGTGAC			4680
GACTGGAAAG			4681
GATGGAGAAT			4682
GAGAGTAACA			4683
GAGAAGTCAG			4684
GAGAAGCGGC			4685
GAGAAGAAGG			4686
GACTTTGGAG			4687
GACTTACCTG			4688
GAGGAAAGCT			4689
GACTGGAAGG			4690
GAGGAAATGG			4691
GACTCTGGGG			4692
GACTACCTTT			4693
GACGACCACG			4694
GACCTGTATG			4695

GACCTGCCCG			4696
GACCTCCAAG			4697
GACAGGTAAC			4698
GACAGGTAAA			4699
GACTGTTGCT			4700
GAGGTGGATG			4701
GCCCGTCAGG			4702
GATCTCGCTT			4703
GATCTAGAAA			4704
GATCGCACGT			4705
GATCCTGGAT			4706
GATCCCAAAT			4707
GATCAATGGA	Human mRNA for KIAA0060 gene, complete cds.	D31766	4708
GAGATGCTGC			4709
GAGTGAGCCT			4710
GATGAGTGGA	Human ferredoxin mRNA, complete cds.	M34788	4711
GAGGGCCTGA			4712
GAGGGAAAAA			4713
GAGGCTGAGG			4714
GAGGCGGCTG			4715
GAGGCCCTGC			4716
GAGGCCAAAG			4717
GAGGAATTTG			4718
GAGGAAGACG			4719
GATAAATATT			4720
GGAGAGGAAG			4721
GGATCTGGCC			4722
GGATCCCCAA			4723
GGAGTAATAA	Human Fc-gamma RIII-1 cDNA for Fc-gamma receptor I	X16863	4724
GGAGGTGCTC			4725
GGAGGGGTGT			4726
GGAGGCAGAA			4727
GGAGCCTTGG			4728
GCCCCCCCCC			4729
GGAGCCAGCT			4730
GGATTTGGCT			4731
GGACTCTGGT			4732
GGACTCATCC			4733
GGACACATCC			4734
GGACAAGATA			4735
GGAAGTGTGT			4736
GGAAGGCAAG			4737
GGAACCTGGG			4738

GGAGCCTTCC			4739
GGCCAGGGCG			4740
GGCCTGTATG			4741
GGCCTGGAAT			4742
GGCCTGCTGG			4743
GGCCGTGTGA			4744
GGCCCTGGAC	H.sapiens mRNA for galectin-8.	X91790	4745
GGCCCGTCAC			4746
GGCCCGAGTT			4747
GGATGGGTGT			4748
GGCCAGGTAA			4749
GGATTAGGGT			4750
GGCATCATCA			4751
GGCAGGACAC			4752
GGCAGCTATA			4753
GGCAGCAGTA			4754
GGCACGTTTT			4755
GGCAAAACCC			4756
GGATTTTGGC			4757
GCTTCTCTAA			4758
GGCCCATATG			4759
GCCTCCCAGG			4760
GCTTTTTAGG			4761
GCGACTCGAT			4762
GCGACGGCAG			4763
GCGAACGTGG			4764
GCCTTGTTCA			4765
GCCTTGCCTG	Human mRNA for KIAA0280 gene, partial cds.	D87470	4766
GCCTTCCGTG			4767
GCGCCTGCCG			4768
GCCTGCGCTG			4769
GCGCGCCGCT			4770
GCCTCCAGAT			4771
GCCTCCACAA			4772
GCCTCAGCGC			4773
GCCGGTTGGC			4774
GCCGGGGAAG			4775
GCCGGAGGGC			4776
GCCGAGGGAG			4777
GCCCTGATTT	Human interferon regulatory factor 5 (Humirf5) mRN	U51127	4778
GCCTGTGGAT			4779
GCTCTCATCC			4780
GACACCAGCC			4781
GCTTCAGTGG			4782

GCTGGGTTAA			4783
GCTGGGAGTC			4784
GCTGGGACTA			4785
GCTGACTTGC			4786
GCTGACACTG			4787
GCGCCCAGCC			4788
GCTCTGCCCC			4789
GCTTCTGGCA			4790
GCTCGTGGTC			4791
GCTCAAAAAA			4792
GCTAAAGGTT			4793
GCTAAACTGG			4794
GCGGTTACTG			4795
GCGGCCGCCG			4796
GCGGCAGTCC			4797
GCGCGTGCTG			4798
GCTCTGTTCA	Homo sapiens Ser/Arg-related nuclear matrix protei	AF0489	4799
CCCTGCCCTT			4800
CCTAACTGAC			4801
CCGTCCGGTG			4802
CCGTCCAAAG			4803
CCGGTTGATG			4804
CCGGGTTATT			4805
CCGCTACGGA			4806
CCGAGTGCTC			4807
GACAGGCTGG	Human collagen type XVIII alpha 1 (COL18A1) mRNA,	L22548	4808
CCCTGGGGTC			4809
CCTCATAAGG			4810
CCCTGCCCTC			4811
CCCTCTTTGT	Homo sapiens MutS homolog (MSH5) mRNA, complete cd	AF0347	4812
CCCTCTGGAT			4813
CCCTCCTGCT			4814
CCCTCCCAGC			4815
CCCTCAGCAC	Human mRNA for vascular anticoagulant-beta (VAC-be	X16662	4816
CCCTCACAGA			4817
CCCTTTGAAC			4818
CCTGGCCCTT			4819
CCTTGGAGAA			4820
CCTTCTGGTG	Human protein tyrosine kinase mRNA, complete cds.	U02680	4821
CCTTCCTCAT			4822
CCTTATATTT	Human mRNA for TPRD, complete	D83077	4823

	cds.		
CCTGTTGTCC			4824
CCTGTATCCC			4825
CCTGTAATCA			4826
CCTAGCAGAG			4827
CCTGTAAACC			4828
CCTATCGTCC			4829
CCTGGCCCTC			4830
CCTGCCCCCT			4831
CCTGAGAATT			4832
CCTCCCCTGC			4833
CCTCCAGTAC			4834
CCTCCAGCCA			4835
CCTCCAGCAG			4836
CCCGAGGAAG			4837
CCTGTAAAGC			4838
CCAATGCACT			4839
CCCTAGGAGA			4840
CCAGAGTCTC			4841
CCACTTGCCC			4842
CCACTTCCTC			4843
CCACTGTTTC			4844
CCACTGCACG			4845
CCACTCAATA			4846
CCAGGCCCCT			4847
CCACCTCCCA			4848
CCAGTGTCTG			4849
CCAATGAACT			4850
CCAATAAAAG			4851
CCAAGGGCTT			4852
CCAACTCTCA			4853
CCAACCCTGG			4854
CCAAAGCCAG			4855
CCAAAGAGTA			4856
ATGGCCCATA	H.sapiens mRNA for putative carboxylesterase.	Y09616	4857
CCACGTGTCC			4858
CCCATCGGTC			4859
CGAAGAGCCA			4860
CCCCTAATTG			4861
CCCCGGCCAG			4862
CCCCCTGCAA			4863
CCCCCCACAC			4864
CCCCCAGCCC			4865
CCCCATACTA	Human mRNA for KIAA0279 gene, partial cds.	D87469	4866

CCAGCGCACC			4867
CCCATCGTGG			4868
CCCGCCTGGC			4869
CCCAGGAGCA			4870
CCCAGCTGGA			4871
CCCAGCCTCT			4872
CCCACCGGTG			4873
CCCAAGTGTC			4874
CCATTGCTCT			4875
CCATCTTGGA			4876
CCATATGATC			4877
CCCATTCGTC			4878
CTTATTGTCC			4879
CTGGGAGCCC			4880
CTTTCCCAGC			4881
CTTTCCAGAC			4882
CTTTATGTGT	Human (ard-1) mRNA, complete cds.	U14575	4883
CTTGTGGTAC			4884
CTTGGTAATT			4885
CTTGCGTGAG			4886
CTTTCTCTAA			4887
CTTCCTGCTC			4888
CTTTTAAGAA			4889
CTTATTGCCC			4890
CTTATGGTCC			4891
CTGTTTGGTG			4892
CTGTGTGCCA			4893
CTGTAGCAGT			4894
CTGGTGAGTG			4895
CTGGGTTAAC			4896
CCTTTCTCCT			4897
CTTCCTGTGA			4898
GAAGCAGCAG			4899
GGCGCACTCT			4900
GACAAGTTGG			4901
GAATCCTGTG			4902
GAATACAGTT			4903
GAAGTTCTCT	H.sapiens mRNA for 21-Glutamic Acid-Rich Protein (	X93498	4904
GAAGGGATTT			4905
GAAGGATGTG			4906
CTTTCCTGTT			4907
GAAGCAGGGC			4908
CTGGGAACAT			4909
GAACTCTGAC			4910
GAACGCTGGG			4911

GAACGACACG			4912
GAACCTTCAG			4913
GAACACCTCC			4914
GAAAGTCGGA			4915
GAAAATATAC			4916
GAAAAGGGCA			4917
GAAGCATCCC			4918
CGGCGATCAT			4919
CTGGGTTAAA			4920
CTAGGTTAAT			4921
CTAGCAGCTT			4922
CTACAGACTT			4923
CTAAGATTTC			4924
CTAAGACCTT			4925
CTAAAATGCT	Human glycogenin mRNA, complete cds.	U31525	4926
CTATGGTAAT			4927
CGGGTCCTCT			4928
CTATGTGTTA	Human RNA helicase A mRNA, complete cds.	L13848	4929
CGGACAAACC			4930
CGCCTGTTAG			4931
CGCCTGGGGT			4932
CGCCGCCCGG			4933
CGCCCTCAAA			4934
CGAGTCAACA	Homo sapiens Na+/H+ exchanger regulatory factor 2	AF0357	4935
CGAGACGCAT			4936
GACACCCCCT			4937
CGGTTAAGAA			4938
CTGAATGAGA			4939
CTGGCTCCAT			4940
CTGGCTCATA			4941
CTGCTTGGGC			4942
CTGCTGCACT			4943
CTGCTCCAAA			4944
CTGCCCCACA	Human nuclear protein Skip mRNA, complete cds.	U51432	4945
CTGCAGTGCG			4946
CTATAGTTTG			4947
CTGACATTTC			4948
CCTTTTTTTT			4949
CTGAAACCCC			4950
CTCTCTGTCC			4951
CTCGTCTGTG			4952
CTCCTCAAGC			4953

CTCCTCAACT			4954
CTCCTAATTG			4955
CTCCACCCGA	Human secretory protein (P1.B) mRNA, complete cds.	L15203	4956
CTCAATGGCA			4957
CTGATTTGTA	Homo sapiens poly(ADP-ribose) glycohydrolase (hPAR	AF0050	4958
TGATGCTCTT			4959
TGCCCTTAGG			4960
TGCCCTCGAA			4961
TGCCACTTTT			4962
TGCCACCAAC			4963
TGCATCTTCA			4964
TGCAGCGCTG			4965
TGCACGTTTC			4966
TCAGAGTAGG			4967
TGATGTTCCA	Human mRNA for KIAA0314 gene, partial cds.	AB0023	4968
TGCTCCTACC	Human mRNA for IgG Fc binding protein, complete cd	D84239	4969
TGATGATGTT			4970
TGATCAAAAA			4971
TGATATGTCA			4972
TGAGCTTGAT			4973
TGAGAAGAAG			4974
TGACTTATTA			4975
TGACCTGAAA			4976
TGATTTTTGA			4977
TGGAGGTGGA			4978
TGGGTGTGTA			4979
TGGGTCATTT			4980
TGGGGGCCGA			4981
TGGGCTCTGA	Human mRNA for lysosomal sialoglycoprotein, comple	D12676	4982
TGGGAGAAGT			4983
TGGCCCCAGG	Human mRNA for precursor of apolipoprotein CI (apo	X00570	4984
TGGATGTACA			4985
TGCCTCAAAA			4986
TGGATATCAG			4987
TGCGTGACAG			4988
TGGAGAGCCT			4989
TGGAAGGGCC			4990
TGGAACTGTA			4991
TGCTTTTGGG			4992
TGCTTTCTTT			4993

TGCTTGTGTA			4994
TGCTGGAGAA			4995
TGAATGAATG			4996
TGGATCAGAT			4997
TCCCCGTGGC	Human mRNA for KIAA0018 gene, complete cds.	D13643	4998
TGACCAGGCC			4999
TCCTAGGGTG			5000
TCCCTCAAGA			5001
TCCCTATTTA			5002
TCCCTATCAA			5003
TCCCTAATTA			5004
TCCCTAAAGC			5005
TCGCGGCCTG			5006
TCCCCTCAGG			5007
TCGGATGAAG			5008
TCCCAGTACA			5009
TCCACTGACG			5010
TCCACAAGCA			5011
TCATTTGCTC			5012
TCATCTGTGA			5013
TCATCTACAA			5014
TCATCGACAG			5015
GGCGACAGAG			5016
TCCCGCCCCC			5017
TCTGCGGGTG			5018
TGGTTTTGAG			5019
TGAAGCCTTG			5020
TGAAGCCAGT			5021
TGAAATACTG			5022
TGAAACTGCA			5023
TGAAAATTCA			5024
TCTTGGCCTT			5025
TCGATGATTA			5026
TCTGTAGCTT			5027
TGACACGTTT			5028
TCTGCCTCAA			5029
TCTGACAAAG			5030
TCTCTTGCTG			5031
TCTCTGAGCT			5032
TCTCTGAAAA			5033
TCTAAGTACG			5034
TCTAAGGAGT			5035
TCTAAAGGTC			5036
TCTGTTTTAG			5037
TTGGCCTTTT			5038

TTCTGGGGGC			5039
TTGTATAGAC	Human DNA-binding protein (mbp-1) mRNA, complete c	M32019	5040
TTGTAGTTTG	Homo sapiens putative seven pass transmembrane pro	AF0278	5041
TTGTAAATGC			5042
TTGGTCCTTC			5043
TTGGTAAGAC			5044
TTGGGGACGG			5045
TTGTGGGTGC			5046
TTGGCTGGGC			5047
TTGTGTGATG	Human mRNA for KIAA0071 gene, partial cds.	D31888	5048
TTGGCCGGGC			5049
TTGGCCCACG			5050
TTGGACATTT			5051
TTGCTGTAGA			5052
TTGCTATTTA			5053
TTGCCCACGG			5054
TTGAATTGAA	Homo sapiens mRNA for BCL7B protein, short isoform	AJ2239	5055
TGGTAGACAT			5056
TTGGGGAAAA			5057
TTTGGAAAAA			5058
TTTTTTGAAA	Homo sapiens phospholipid scramblase mRNA, complet	AF0084	5059
TTTTGTCTTA			5060
TTTTGTACGC	Human myeloid differentiation primary response pro	U70451	5061
TTTTCTGTAC			5062
TTTTCACCAA			5063
TTTTATAAGG	Homo sapiens clk2 mRNA, complete cds.	L29218	5064
TTTTAAAATA			5065
TTGTGATGTA			5066
TTTGTAATCG			5067
TTCTCTTCTT			5068
TTTGAGTGAC			5069
TTTGAGACTC			5070
TTTCCCTCCC			5071
TTTCCCAGGC			5072
TTTCATACAC			5073
TTTATTTAGT			5074
TTTATGAAGT			5075
TTTATCCCTT			5076
TTTGTTGAGA			5077

TGTGCACAAT			5078
TTCTGTGAAT	Homo sapiens mRNA for caldesmon, 3' UTR.	AJ2238	5079
TGTGTAAATC	Human mRNA for KIAA0121 gene, complete cds.	D50911	5080
TGTGGTGGCG			5081
TGTGGGCCTC			5082
TGTGGGAGTA			5083
TGTGGCCTCA			5084
TGTGGAGCTG			5085
TGTGTGTGTG	Homo sapiens clone 23559 mRNA sequence.	AF0353	5086
TGTGCCACTA			5087
TGTTACTTGC			5088
TGTGAATAAA	Human HepG2 3' region MboI cDNA, clone hmd6c04m3.	D17286	5089
TGTCTGGGCA			5090
TGTCGTGGAG			5091
TGTATTTTCC			5092
TGTATTTGTA			5093
TGTAATATGG			5094
TGTAAACTTG			5095
TCACCCCACA			5096
TGTGCCCCTG			5097
TTCAATACAC			5098
TTCTCAGCCC			5099
TTCTAATGTA			5100
TTCTAACTCC			5101
TTCCTCTCCG			5102
TTCCGGAACT			5103
TTCCCTCTCC			5104
TTCCCAGACC			5105
TGTGTACCTG			5106
TTCACAGAGC	Homo sapiens mRNA for repressor protein, partial c	D30612	5107
TGGTGACATT	Human fetal brain oculocerebrorenal syndrome (OCRL	U57627	5108
TTCAAAAAAA			5109
TTAGTCCTCT			5110
TTACAGACTT			5111
TTAATTTTCA			5112
TTAAAACGTG			5113
TGTTTTGAGA			5114
TGTTCAAAGT			5115
TGTTATTACT			5116
TTCCACCTTC			5117

GTGATACACA			5118
GTGGACAGTA	Human mRNA for KIAA0100 gene, complete cds.	D43947	5119
GTGCTTGTAC	Homo sapiens mRNA for glia maturation factor, comp	AB0011	5120
GTGCGGAGGG			5121
GTGCGGAGGC			5122
GTGCCCGGCA			5123
GTGCCCACGG			5124
GTGCCAGGGA			5125
TCATACACCT			5126
GTGATGCCTG			5127
GTGGATTCAT			5128
GTGAGACCTT			5129
GTGACCCACG			5130
GTCATTTAGT			5131
GTATTTCCGG			5132
GTATCTGAGC			5133
GTATAATTTG			5134
GTAGGCACGG			5135
GTGATGGGGG			5136
GTGGCGAGTG			5137
GTGGTGCGCA			5138
GTGGGTACAA			5139
GTGGGGCCCC			5140
GTGGGCTAGG			5141
GTGGGCGGGC			5142
GTGGGCCAAG			5143
GTGGCGTGGT			5144
GTGGACCACG			5145
GTGGCGCGCG			5146
GTGGATGCTG			5147
GTGGCCCAGC			5148
GTGGCCACGC			5149
GTGGCCACCG			5150
GTGGCCAACG			5151
GTGGCACTTG			5152
GTGGCACTCT			5153
GTGGCACCAG	Human signal transducer and activator of transcrip	U47686	5154
GTAATACTGA			5155
GTGGCGGAGG			5156
GGGAAAAGTG	Human Fas-associated death domain protein interleu	U86214	5157
GTAGAAAAAA			5158
GGGCATCTCC			5159

GGGCAGCAAG			5160
GGGATTTGGG			5161
GGGATGCACA			5162
GGGAGCCCCC			5163
GGGACAAACA			5164
GGGCTGAACA	Homo sapiens U4/U6 small nuclear ribonucleoprotein	AF0163	5165
GGGAAATCGC			5166
GGGCTGGGCT			5167
GGCTTTTAAG			5168
GGCTGTAGAG			5169
GGCTGGAGCT			5170
GGCTGCACGG			5171
GGCTGACCCT			5172
GGCTCATCTT			5173
GGCTAAGGAG			5174
CATTTATCAA			5175
GGGAAGAAAA			5176
GGGTGAGGGG			5177
GTGGTTCACA			5178
GGTTTTTGTT			5179
GGTTTTGCTT			5180
GGTGGTGATG	Human (p23) mRNA, complete cds.	L24804	5181
GGTGAGCGTG	H.sapiens HEK2 mRNA for protein tyrosine kinase re	X75208	5182
GGTGACAATA	Homo sapiens mRNA for NKG2-CII activating NK recep	Y13055	5183
GGTATCTGGG			5184
GGGCCAGCCC			5185
GGGTGGGCAG			5186
GTACGCATTC	S300-II=transcription factor [human, mRNA Partial,	S44184	5187
GGGTGAAGGG			5188
GGGGTCCTTC	Human mRNA for KIAA0082 gene, partial cds.	D43949	5189
GGGGGCCCCA			5190
GGGGCTGGAG			5191
GGGGCCAGGA			5192
GGGGAGGTAG			5193
GGGGAGAAGC			5194
GGGGAAGCAG			5195
GGGTTTGGCC			5196
TACCCTGGAA	Human class II alchohol dehydrogenase (ADH4) pi su	M15943	5197
TAATCATTCA			5198
TAGCTGCCTT			5199

TAGCTATCCA			5200
TAGCCTTGGA			5201
TAGATCAGAG			5202
TAGAGAATGA	Human mRNA for TI-227H.	D50525	5203
TACTTTATTT			5204
TAGCTTTGCC			5205
TACTCCAGAA			5206
TAGGCTCCAT			5207
TACCCGTACA			5208
TACCCCAGAA			5209
TACCATCCAA			5210
TACCACCAAT			5211
TACATATGGA	Human mRNA for KIAA0248 gene, partial cds.	D87435	5212
TACAGCCCCC			5213
TACAGAGTTT			5214
GTGGTGCGCG			5215
TACTGAAACA			5216
TATGTAAAAT			5217
TCACAAAAGA			5218
TCAATAAAAG			5219
TCAAGTCCAG			5220
TATTTTCTGC			5221
TATTTATATG	Homo sapiens cig41 mRNA, partial sequence.	AF0269	5222
TATTGTTGGT			5223
TATTCAAAGG			5224
TAGCTGGGAC			5225
TATGTCTGCA			5226
TAATAAAGGC			5227
TATCATTATT			5228
TATATAAGCT			5229
TAGTTGAGGT			5230
TAGTGAAATG	Homo sapiens CASK mRNA, complete cds.	AF0355	5231
TAGTCATCTT			5232
TAGTAGGGTG			5233
TAGGTGACTC			5234
TAGGGGTTTC			5235
TATGTGCGTG			5236
GTTATTTTAC			5237
TACAGACTCT			5238
GTTCCTCCCC			5239
GTTCCGGAGG	Human clone X-1b mRNA from chromosome X.	U66049	5240
GTTCCACCAG			5241

GTTCCACATT			5242
GTTCCAAAAA			5243
GTTCAGTCAG			5244
GTTGCTAGGA			5245
GTTCAGAACT	H.sapiens mRNA for ORF (clone lCRFp507G2490).	Z70222	5246
GTTGCTGAGG			5247
GTTATATCCA			5248
GTTAGAGCAG			5249
GTGTTCTTTG			5250
GTGTGAAAAA			5251
GTGTCCTTGT			5252
GTGTAGAAAT			5253
GTGGTTTGGC			5254
GGCGACCGTT			5255
GTTCAGCTCT			5256
TAAATGTTGA	Human clone 23721 mRNA sequence.	U79291	5257
TAAGTTTAAT	Human sterol carrier protein X/sterol carrier prot	M75883	5258
TAAGGGAGCT			5259
TAAGGATTTT			5260
TAAGCCCAAG			5261
TAAGCATTAA	Human scaffold protein Pbp1 mRNA, complete cds.	U83463	5262
TAACTTACAT	Human mRNA for KIAA0269 gene, complete cds.	D87459	5263
TAACCATCAA			5264
GTTCCTTGGC			5265
TAAATTACCA	H.sapiens SPR-2 mRNA for GT box binding protein.	X68560	5266
GTGGTGGATG			5267
TAAATAAAGG			5268
TAAAGCAGTA	H.sapiens mRNA for restin.	X64838	5269
TAAAATGTTT			5270
TAAAAGGAGG			5271
GTTTGTTCAA			5272
GTTTGGGGGG			5273
GTTTCCTTTG			5274
GTTGTGGTAA			5275
TAACAAAAAT			5276
GCCAAGAATC			5277
GCCGAGGGAA			5278
GCCCTAGCAA			5279
GCCCGCAGTT			5280
GCCCCGGAGC			5281
GCCCCCTGGG			5282

GCCCCCAGAT			5283
GCCCAGGGAC			5284
GCTTCCCAGC	Homo sapiens mRNA for CDEP, complete cds.	AB0084	5285
GCCAGTCAAA			5286
GCCTGGCCTG			5287
GCCAAAGAGA			5288
GCATTTTGTG			5289
GCATCCGGAG			5290
GCAGCACGCT			5291
GCAGACATTG			5292
GCACCCGCCT			5293
GCAAGGTTGC			5294
GCCAGTGCCT	Human mRNA for RD protein, RNA-binding.	X16105	5295
GCGGCGGCGG			5296
CATTTTGGGG	Homo sapiens EEN-B2-L4 mRNA, complete cds.	AF0362	5297
GCTGTAGGGG			5298
GCTGCCAAAA			5299
GCTGCAGACA			5300
GCTCTGGTTC			5301
GCTCACTGCA	Human cyclophilin-like protein CyP-60 mRNA, comple	U37219	5302
GCTAGTGAAA			5303
GCCGCCTCTC			5304
GCGGCTGCGC			5305
GCCTCCAGGG			5306
GCGGCGCCCT			5307
GCGGCCAGTA			5308
GCGCTGCTTT			5309
GCGAGCTGAA			5310
GCCTTCTGCT	Human PL6 protein (PL6) mRNA, complete cds.	U09584	5311
GCCTTAGGGT			5312
GCCTGGCTGG	Human thiazide-sensitive Na-Cl cotransporter (hTSC	U44128	5313
GATGTGCTGG			5314
GCTAAACTCT			5315
GAATAAATTG			5316
GCAAATCTGA			5317
GACTGAGCTT			5318
GACTCAGCTG			5319
GACTATAGCG			5320
GACCGCCTGT			5321
GACCCCTAAA			5322

GACCAACAGT			5323
GAGAACCCAG			5324
GAATGAAGCT			5325
GAGAAGCCCG			5326
GAATAAACAC			5327
GAAGGTCCTG	Human pyruvate dehydrogenase E1-beta subunit mRNA,	M34055	5328
GAAGACGGTG			5329
GAACAAGCCA			5330
GAACAAATGG			5331
GAAAAATCAA			5332
CTTTTGTCGT			5333
CTTCTATGTA	Human mRNA for KIAA0177 gene, partial cds.	D79999	5334
GACATCGAGG			5335
GAGCTGGTGA			5336
GCTTGTACCT			5337
GATGCATTAG			5338
GATCCCCAAT			5339
GATATGAGGG	Human p21-activated protein kinase (Pak1) gene, co	U24152	5340
GAGTTTTGTG			5341
GAGTCAGCAT			5342
GAGGGCCTTC			5343
GACTTGGCGG			5344
GAGGACCCCT			5345
GCAAAATAAC	Human initiation factor 4D 9eIF 4D) mRNA, complete	M23419	5346
GAGCCTCACA	Human mRNA for KIAA0076 gene, complete cds.	D38548	5347
GAGCACAGGT	Human protein-serine/threonine (AKT2) mRNA, comple	M95936	5348
GAGATGGATA			5349
GAGAGGTCAC	Homo sapiens hyaluronidase (LUCA-3) mRNA, complete	AF0407	5350
GAGAGGAAAC			5351
GAGAGCAGCC			5352
GAGACTTGAG	Human leukocyte adhesion protein (LFA-1/Mac-1/p150	M15395	5353
GAGACTGCTG			5354
GAGGAGCCCC			5355
GTGAAAGCCC			5356
GTGGCAGATG			5357
GTGGAGGTTC	Homo sapiens mRNA for putative GTP-binding protein	Y14391	5358
GTGCTATCCT			5359

GTGCCACTGC			5360
GTGCAGTCCT			5361
GTGCAGAAGC			5362
GTGAGTGTGT			5363
GCTTACAGGT			5364
GTGAACCCCG			5365
GTGGCGGGAG	H.sapiens mRNA for RAP74.	X64002	5366
GTGAAACGCC			5367
GTCTGTGCAG			5368
GTCTAGAATC			5369
GTATTTAACA			5370
GTATGATCCT			5371
GTAGCAAAAA			5372
GGTGAGCTAC			5373
GTGAGACCCT	Human Myf-3 mRNA for myogenic determining factor 3	X17650	5374
TAAATATGCA			5375
TACACCAAGA			5376
TAATTTTTAA	H.sapiens RR2 mRNA for small subunit ribonucleotid	X59618	5377
TAATCGAAAC			5378
TAATATAATT			5379
TAATACTCCA			5380
TAAGGAAGGC	Homo sapiens mRNA for KIAA0601 protein, partial cd	AB0111	5381
TAACTCCATT			5382
GTGGCATCCC			5383
TAAATTCAAG			5384
GTGGCCTGTG			5385
TAAAGCCTTT			5386
GTTTGTACAA			5387
GTTTCTATCA	Homo sapiens clone 23797 and 23917 mRNA, partial c	AF0352	5388
GTTTCCCCAA			5389
GTTAATCTGG			5390
GTGTTTATTA			5391
GTGTACTCAT	Homo sapiens serine protease (Omi) mRNA, complete	AF0207	5392
GGTCCAAAAT			5393
TAACAAACCT			5394
GGACTTTCCT	Human mRNA for RTP, complete cds.	D87953	5395
GGTGAAACCC			5396
GGCAACAGAG	Homo sapiens clone HEA6 Cri-du-chat region mRNA.	AF0092	5397
GGCAAAACCA			5398
GGATGTGGAG			5399

GGATGCGCAG			5400
GGATCCAAGT			5401
GGAGTCCTAG	Ig V kappa =anti-single/double-stranded DNA antibo	S59162	5402
GGCACTGCAG			5403
GGAGCCATTC			5404
GGCAGGATGA			5405
GGACTGGGTC			5406
GGACTGAGTC			5407
GGACTCTGGG			5408
GGAAGTTCAA	H.sapiens unusual BuChE mRNA.	X52767	5409
GGAAGGGTGT			5410
GGAAGGGGAA			5411
GGAAAGCCAG			5412
GGAAAAATGG			5413
GGAGGTGGAG	Human clone AZA3 Alu repeat sequence.	U02046	5414
GGGCCCGTAC			5415
CTTAATAAAA			5416
GGGTTTTATA			5417
GGGTTCCCCG			5418
GGGGGCGCCT			5419
GGGGGCAGGG			5420
GGGCTCCAGG			5421
GGGCGCCTCC			5422
GGCACCGTGG			5423
GGGCCGTGGG			5424
GGTCCCGTTC			5425
GGGCAACGTG			5426
GGGAGGAACA			5427
GGCTCTCCCT			5428
GGCGAAACCC			5429
GGCCCAGCTG			5430
GGCCAGTGTT			5431
GGCATCAAGT			5432
GGCAGGGCTG			5433
GGGCCTAAAC			5434
AGGCCAGGAG			5435
ATCACTTGGG			5436
ATATGAAGCA			5437
ATATACTGTA			5438
ATACTTACAT			5439
ATACATAATA			5440
AGTTTATGCC			5441
AGTTGTATAT			5442
CTTCCTGTAT			5443

AGGGAAGCTG			5444
ATCATTTGTT			5445
AGGCAGGGAC			5446
AGGCAGGCTC			5447
AGGCAGACGG			5448
AGGAGATGGA	Homo sapiens clk3 mRNA, complete cds.	L29217	5449
AGGACAGAAG			5450
AGCTGACCCG			5451
AGCTCTATGA			5452
AGGTGGCAAC			5453
ATGGCAGGCG			5454
ATGTTCAGGC			5455
ATGTGATTGT	Human mRNA for PIG-F (phosphatidyl-inositol-glycan	D13435	5456
ATGTAAAGTG			5457
ATGGTGACTC			5458
ATGGCTGGGT			5459
ATGGCGTTTC			5460
TTTTTTTTTT	Human p55CDC mRNA, complete cds.	U05340	5461
ATCAGTATGT			5462
TTGGGGTTTC	Human mRNA for apoferritin H chain type.	X00318	5463
ATCATACCAC			5464
ATGCCTTTGA	Human mRNA for cGMP-dependent protein kinase type	D45864	5465
ATGCCCGAGG			5466
ATGCAGCCGT			5467
ATGAGGGTCC			5468
ATGAGCGTCT			5469
ATGACCTGAA			5470
ATCTGAGGTT			5471
AGCCACGTTG	Human adipocyte acid phosphatase mRNA.	M87545	5472
ATGGCCGGTA			5473
ACAGCCCATT			5474
AGCGCCGATG			5475
ACGTGGAGCT			5476
ACGTGCCTCA			5477
ACGCAACAGG			5478
ACCTTATCAA	H.sapiens Mpv17 mRNA.	X76538	5479
ACCCGCGGTA			5480
ACCACAGCAA			5481
ACTCCAAGGA			5482
ACATAGAGTG			5483
ACTCCTTCCT			5484

ACAGACACAA			5485
ACACAGATTT			5486
ACAACACCCC	Homo sapiens mRNA for inositol 1,4,5-trisphosphate	D38169	5487
ACAAACAAAA			5488
AATTTTCAGT			5489
AATTGTGCAT			5490
AATTCAGTGA	Human CW-1 mRNA, complete cds.	U56255	5491
AATGTCATTG			5492
ACATTGGTAA			5493
AGAATTTGCA			5494
ATTTAAAAAA			5495
AGCATCTAAC			5496
AGCAGGCTCA			5497
AGCAGGAGCC			5498
AGCACCTCCC			5499
AGAGAGAGTC			5500
AGAGACTCTT			5501
ACTACTAAAT			5502
AGACAGTAAT			5503
AGCCAGCCAC			5504
AGAAATGTGA			5505
ACTTTTGCCC			5506
ACTTTGTGGG			5507
ACTTGAAAGG			5508
ACTTATGTTT			5509
ACTGCAGAGC			5510
ACTGAAAGGC			5511
ACTCTAAGTG			5512
AGACCCTGTC			5513
CGCAGGCACC			5514
CCGGAAACAC			5515
CTAGAAAGGT			5516
CTAAGATTCA			5517
CGTTTAATCA			5518
CGTGTGTGCC			5519
CGGTCCCGTT			5520
CGGCAAAAAA			5521
CTAGCGCGTG			5522
CGCGCACCCG			5523
CTATCAGTTT	Homo sapiens dynein light intermediate chain 2 (LI	AF0358	5524
CGCAACTGCG			5525
CCTGTTATCC			5526
CCTGTAGATG			5527
CCTGGCCATC			5528

CCTGCACACT			5529
CCTCTGTCCC			5530
CCTCCTGGGG			5531
ATTCCTGACC	Homo sapiens PHD Finger 1 (PHF1) mRNA, complete cd	AF0296	5532
CGGACAATCA			5533
CTGCTGTAAT			5534
TACAGAGCTC			5535
CTGTGCCCCA			5536
CTGTATTTGA	Human transformer-2 alpha (htra-2 alpha) mRNA, com	U53209	5537
CTGGGGCCTG			5538
CTGGGGAGGG			5539
CTGGCCGACT	Human proline and glutamic acid rich nuclear prote	U88154	5540
CTGGAGACTC			5541
CTAGAGAACT			5542
CTGGACCAGT			5543
CCGCCTTCGG			5544
CTGCCCTGGA	Homo sapiens clone NBB9 Cri-du-chat region mRNA.	AF0092	5545
CTGCAAGTTC			5546
CTGACCCCCT			5547
CTGAATTCCC			5548
CTCATATGTT			5549
CTCATAAGGG			5550
CTCACCGCCC	Human cellular retinoic acid-binding protein II (C	M68867	5551
CTATTTAGTT	Human alpha-L-fucosidase, complete cds.	M29877	5552
CTGGACTGGG			5553
CACCAAACTT			5554
CCGGCCGCCT			5555
CATACTTCAA			5556
CAGGGCGGGT	Human Hsp27 ERE-TATA-binding protein (HET) mRNA, c	U72355	5557
CAGGCATCCC			5558
CAGGATGACG			5559
CAGATAACAT	Human mRNA for KIAA0016 gene, complete cds.	D13641	5560
CACTTTCAAG			5561
CCACGGCACT			5562
CACCTAACTG			5563
CCACTCTTGA			5564
CACACCCCTG	H.sapiens mRNA for putative progesterone binding p	Y12711	5565

CACACAGCAC			5566
CACAAACTGA			5567
CAAGGTGAAA			5568
CAACTGGAGT	Human mRNA for KIAA0384 gene, complete cds.	AB0023	5569
CAAAGGCAGC			5570
ATTTTTTCAA	H.sapiens mRNA for PAPS synthetase.	Y10387	5571
CTTCAACATC			5572
CACCTAATGG			5573
CCCACAATCC			5574
CCCTTCGAGA			5575
CCCTAATTGC			5576
CCCCTGGGAC			5577
CCCCCAATTC			5578
CCCCATCGGT			5579
CCCCAAGGTG			5580
CCCAGCCACA			5581
CATTTAAGTT	H.sapiens mRNA for protein induced by vitamin D.	X98091	5582
CCCACCGTCC			5583
ATTCTTACAG			5584
CCATTCTCCT			5585
CCATACAGAA			5586
CCAGTTTTGC			5587
CCAGCAAGAG			5588
CCAGAATCTT			5589
CCACTTCCAA			5590
CCACTTCACT			5591
CCACTGTGCT			5592
CCCACTGCCC			5593
AGCCACCTCC			5594
AGCTGTCTCA			5595
AGCTGCTTCA			5596
AGCGTGGAGG			5597
AGCGGAAGAG			5598
AGCCTGGGAG			5599
AGCCTCTTCA			5600
AGCCCTACGA			5601
ACACATATTA			5602
AGCCAGATCC			5603
AGGATGAGGG			5604
AGCAGCTTCT			5605
AGCAGCGGGG			5606
AGCAGATTCA			5607
AGCAGATCCA			5608

AGATTGGTGA			5609
AGATTCAGAG			5610
AGATGGGCGA			5611
AGCCCACCGC			5612
AGTCAGCTGG	Human epidermal growth factor receptor kinase subs	U12535	5613
ATAATACCAG			5614
ATAAAGCCGA			5615
AGTTCCTGGT			5616
AGTTCCAGGA			5617
AGTGTATTTT	Human cation-independent mannose 6-phosphate recep	J03528	5618
AGTGCACGTG			5619
AGTCTCCCCT	Human putative chromatin structure regulator (SUPT	U46691	5620
AGGAAACGAG			5621
AGTCCAATGG			5622
AGGAATGTTA			5623
AGGTCCCCTG			5624
AGGTCAGAGG			5625
AGGGGAAGGT			5626
AGGGCAGTAC			5627
AGGCGGCAAG			5628
AGGCATTGGA			5629
AGGATGGCGG			5630
AGAGGTTGAT			5631
AGTCCTAATG			5632
ACCCCGTACA			5633
AGATGGCAAG			5634
ACGGCCTGGT			5635
ACGCCCCAAC			5636
ACGACGACCG			5637
ACCTGTTCCC			5638
ACCTCCACCA	Human RNA polymerase II subunit hsRPB4 mRNA, compl	U85510	5639
ACCGTAAGTA			5640
ACGTCATCGA			5641
ACCCCTACAA			5642
ACTATAATCC			5643
ACCCCAAAAA			5644
ACCAGCCTGG			5645
ACCACTGGAA			5646
ACATCTTGCT	Human NIMA-like protein kinase 1 (NLK1) mRNA, comp	U11050	5647
ACATCACTAA			5648
ACAGCTCCCC			5649

ACAGCAAGTT			5650
TACACTTGCC			5651
ACCCTTACAA			5652
AGAAATAAAT			5653
ATATCAATAA			5654
AGAGAGAGAG			5655
AGACGCTTCT	Homo sapiens FRG1 mRNA, complete cds.	L76159	5656
AGACGCGGCT			5657
AGAATAACTG			5658
AGAAGTATGA			5659
AGAAGTAGTG			5660
ACGTCAGATC			5661
AGAAGGAAGG			5662
AGATAAAGAC			5663
ACTTTTTTAT			5664
ACTTTGGTTT	Homo sapiens mRNA for colon cancer clone PM208.	Y13810	5665
ACTGGGTAAA			5666
ACTGATGCAA			5667
ACTGATAACA			5668
ACTCTTGACA			5669
ACTCAGATGC			5670
ACTATTTCAC			5671
AGAAGGAGAG			5672
CAATAAAATG			5673
ATTTTTGCCC	H.sapiens mRNA for MHC class I promoter binding pr	X65463	5674
CACGCGGGGG			5675
CACGAAGATG	Human (memc) mRNA, 3'UTR.	U30999	5676
CACCCCTCAG			5677
CACACCTCCC	H.sapiens mRNA for B cell membrane protein CD22.	X59350	5678
CACACAGATC			5679
CACACACAAA			5680
CACTACTCTG			5681
CACAAAACGG			5682
CACTCATTAA			5683
CAATAAAACT			5684
CAAGGAACAG			5685
CAACCATCCA			5686
CAACACTGTG			5687
CAACAATGTC			5688
CAAATAAACC	H.sapiens mRNA for Pirin, isolate 1.	Y07867	5689
CAAACTATTG			5690
ATAATTCTTG			5691

CACAACGGTA			5692
CAGGGCGAGA			5693
CATTGTGGAG			5694
CATTGCCTTC			5695
CATTCATAAC			5696
CATTCACCAT			5697
CATCTGTACT	Human MHC HLA-Dw12 mRNA, complete cds.	M57648	5698
CATCTGAGAT			5699
CATCCTTGGG			5700
CACTACCCAC			5701
CAGTAAATGA			5702
ATTTTGTCCC			5703
CAGGGCCCCA			5704
CAGGGACAGG			5705
CAGGCCTTCA			5706
CAGCCCCCTG			5707
CAGAAGCACA			5708
CAGAAGAAAA			5709
CAGAAAAGCA			5710
CACTTTGGCC			5711
CATATTCAGT			5712
ATCCTGTCAC			5713
CAAAAGATTA			5714
ATGCGGCCAC			5715
ATGCCTTTTT	H.sapiens mRNA for NBK apoptotic inducer protein.	X89986	5716
ATGCCAGCTG			5717
ATGACTGTAC	H.sapiens mRNA for C1D protein.	X95592	5718
ATCTTGCCCT			5719
ATCTTCTAAA			5720
ATGGCAGGGC	Homo sapiens mRNA for homeodomain protein Prep-1.	Y13613	5721
ATCGGCTCCC			5722
ATGGCGCCTC			5723
ATCCTCCAGT			5724
ATCCGCGGGG			5725
ATCAAGGTGT			5726
ATCAACTGGA	H.sapiens mRNA for NEFA protein.	X76732	5727
ATCAAAGAGT			5728
ATATGTGGTC			5729
ATATGGAATA			5730
ACACAGCAGG			5731
ATCTCAGCTC	Homo sapiens TNF receptor associated factor 5 mRNA	U69108	5732
ATTCCATCTG			5733

ATTTTCCTTA			5734
ATTTTCAAGA			5735
ATTTGTCCCC			5736
ATTGCACCAG			5737
ATTCTTTTTA			5738
ATTCTTCTGA	Human dystrophin-related protein 2 (DRP2) mRNA, co	U43519	5739
ATTCTCCAGG			5740
ATGGCAACAG	Human channel-like integral membrane protein (AQP-	U41518	5741
ATTCCCCAGT			5742
ATACAGTAGT			5743
ATTAAAGTCA	Human mRNA for KIAA0237 gene, complete cds.	D87074	5744
ATGTTTACAC	Human pre-T/NK cell associated protein (5A3) mRNA.	L17329	5745
ATGTTAGATA			5746
ATGTGTTCTA			5747
ATGTGAGGGA			5748
ATGGTGAGTG			5749
ATGGCTTTGT			5750
ATGGCGGCGA			5751
ATTCGGTTAG			5752
TGCAGAAACA			5753
TGGAAGCTAG			5754
TGGAAAAAAA	upstream stimulatory factor=transcription factor [	S50537	5755
TGCTGTTGCT			5756
TGCTACGAAA			5757
TGCCTGCTTG			5758
TGCCTATAGC			5759
TGCCCAGCAA	Homo sapiens G protein-coupled receptor kinase 6,	AF0407	5760
ACACGTACTA			5761
TGCAGACCCA	Human tax1-binding protein TXBP151 mRNA, complete	U33821	5762
TGGCTAGATT			5763
TGCACTTGAC			5764
TGATTTCCAC			5765
TGATTGGTGG	Human platelet-derived growth factor alpha-recepto	L25829	5766
TGATCTGGGA			5767
TGAGTTTTAC			5768
TGAAGGTGGT			5769
TGAAATCTGA			5770
TGCAGTGTGC			5771

TGTCTTTATA			5772
TTAGGTGATG			5773
TTACCGTCCC			5774
TTACAGTGTT	Homo sapiens protein phosphatase 2A B56-epsilon (P	L76703	5775
TTAAGACCCT			5776
TTAAACTCCA			5777
TGTGTGAGCT			5778
TGTGGCCGTG			5779
TGGAGTAGTG			5780
TGTGCGCGTG			5781
TGGCCACGGC			5782
TGTCACAAAC			5783
TGTATTCAGC			5784
TGTATGTAAA			5785
TGTAAGAACA			5786
TGGGTAGGAG			5787
TGGGGTGGAG	Human glutathione transferase Zeta 1 (GSTZ1) mRNA,	U86529	5788
TGGGGCGTGC			5789
TCTGCCTCGT			5790
TGTGCTGTTT	Human PML-1 mRNA, complete CDS.	M79462	5791
TCAAAGTATA			5792
TCTTTGGCCT			5793
TCACTGCATT			5794
TCACTGAGTT			5795
TCACGGCAAG			5796
TCACCGTACA			5797
TCAATAAATG			5798
TCAAGCATCC			5799
TCAGACTTTT			5800
TCAAATCACA			5801
TCAGATGAAA			5802
TATGAAGCCG			5803
TATATTGATT	Human BTG1 mRNA.	X61123	5804
TAGTTTCAAC	Human mRNA for cyclin I, complete cds.	D50310	5805
TAGTCAGGTA	Human mRNA for acetyl-coenzyme A transporter, comp	D88152	5806
TAGTAAGTCA			5807
TAGGTCTCTT			5808
TACTGTAGTC			5809
AATGATGTTC			5810
TCAAATTAAA			5811
TCCTGAAAAA			5812
TTATGCCTCC			5813

TCTGACAAAC			5814
TCTCTGCTGC			5815
TCTCAAGTAA			5816
TCTAGTCACT			5817
TCTAGAATTT			5818
TCCTTTTTCC	Human tyrosyl-tRNA synthetase mRNA, complete cds.	U40714	5819
TCACTGTGGG	Human nonerythroid alpha-spectrin (SPTAN1) mRNA, c	J05243	5820
TCCTGAAATA			5821
TCTTTAGTTG			5822
TCCTCATCCT	Human p18 protein mRNA, complete cds.	J04991	5823
TCCGGCTCTC			5824
TCCCTTATTA			5825
TCCCCGTTAC			5826
TCCAGCAGCT			5827
TCAGTGCGCA			5828
TCAGGTGTTA			5829
TCAGCTGGGG			5830
TCCTGGCTGC			5831
AACGGGGCCC	Human macrophage-derived chemokine precursor (MDC)	U83171	5832
AAATCTGGCA	Human I-plastin mRNA, complete cds.	L20826	5833
AAGCAGATCA			5834
AAGACAGTAG			5835
AAGAACAGTG			5836
AACTGTATAC	Human MHC class II gene.	M84748	5837
AACTGAGGTG			5838
AACTCTGGGT			5839
AAGCCTGTAG			5840
AACTCTAAGG			5841
AAGCTTCTCA			5842
AACGCTGGCC			5843
AACCTTCCTC			5844
AACATCAAAC	Homo sapiens Arp2/3 protein complex subunit p16-Ar	AF0060	5845
AACATACACA			5846
AACAGAATAT			5847
AACACTCGTA			5848
AACAAATTCT			5849
TTAGTCTTCA			5850
AACTCTGGAC			5851
AATCTTGAGT			5852
AATTTAGGCA	Human mRNA for coproporphyrinogen oxidase, complet	D16611	5853

AATTGTGCAG			5854
AATTGCAAGC	Human cofilin mRNA.	D00682	5855
AATTCTCCAT			5856
AATTCGATTG			5857
AATTCATAGG			5858
AATTATCAAC			5859
AAGCCTAAAA	Human breast cancer, estrogen regulated LIV-1 prot	U41060	5860
AATGAAATAA			5861
AAAGGAAAAT			5862
AATCTCAGAC			5863
AATCCTTTGG			5864
AAGGGCCACT			5865
AAGGCTAACG			5866
AAGGCGGAGG			5867
AAGGCCCGAG			5868
AAGGCAGAGA			5869
AAGGAATGGG			5870
AATGGGTGAA			5871
TTCTGTGCTG	Human mRNA for complement component C1r.	X04701	5872
AAATTTTAAT			5873
TTGCCGGTTT			5874
TTGCAACCAA			5875
TTGAGAACTG			5876
TTGACCCAGC			5877
TTGACACACG			5878
TTGAATTGGG			5879
TTGGCCAGAC	Human PM-Scl-75 autoantigen (PM-sc1) mRNA, complet	U09215	5880
TTCTTGTGGG			5881
TTGGCCCTCT			5882
TTCTGTAGCC	H.sapiens mRNA for adenosine triphosphatase, calci	Z69881	5883
TTCTCATAGG			5884
TTCTCATAAT			5885
TTCCTGCTAC			5886
TTCCCGAGGG			5887
TTCCCAAGGG			5888
TTCATATTAA			5889
TACAGAACAC			5890
TTGAATTCCC	Human mRNA for semaphorin E, complete cds.	AB0002	5891
TTTCAATGCC			5892
AAAGAAGCCA			5893
AAACCCAAGC			5894

AAAATTGGCT			5895
AAAATATTAC	Human G protein gamma-10 subunit mRNA, complete cd	U31383	5896
AAAATACTGA			5897
AAAACCTGTA			5898
AAAAACTTTT			5899
TTGGCATTGT			5900
TTTGGTCCTC			5901
TTATACAGCC			5902
TTTATTGAAA			5903
TTTAGGGGGA			5904
TTTAAAAGAG	Human mRNA for KIAA0105 gene, complete cds.	D14661	5905
TTGTGATTAA			5906
TTGGTCCCCT			5907
TTGGGTTGTT			5908
TTGGGGTTGG			5909
TTGGCCTGGC			5910
TTTTCTGTGG			5911

CLAIMS

1. An isolated population of polynucleotides comprising or corresponding to at least one polynucleotide selected from the group consisting of SEQ ID NOS. 1 through 5911 and their respective complements.

2. A population of polynucleotides comprising or corresponding to a population of tags selected from the group 1-5, 1-17, 18-24, 1-24, 25-36, 1-36, 18-36, 37-53, 54-74, 37-74, 1-53, 1-74, 75-116, 1-116, 117-279, 1-279, 280-549, 1-549, 550-1160, 1-1160, 1161-3175, 1-3175, 3176-3183, 3184-3197, 3176-3197, 3198-3204, 3176-3204, 3205-3213, 3176-3213, 3214-3226, 3176-3226, 3227-3242, 3176-3242, 3243-3294-3176-3294, 3295-3381, 3176-3381, 3382-3554, 3176-3354, 3555-4012, 3176-4012, 4013-5911-3176-5911, 1-5911, or any combination thereof.

3. The population of claim 1, wherein the one polynucleotide comprises or corresponds to a novel tag or its complement.

4. The population of claim 1, wherein the one polynucleotide comprises or corresponds to a tag or its complement that is overexpressed in cells derived from a primary breast tumor.

5. The complement of the polynucleotide of claims 1 or 2.

6. An isolated novel polypeptide expressed by a polynucleotide of claim 5.

7. A solid phase support comprising a polynucleotide of claims 1 or 2,

8. An array of probes comprising a polynucleotide of claims 1 or 2 bound to a chip.

9. A method of aiding in the diagnoses of the metastatic condition of a metastatic breast cell comprising determining differential expression of a polynucleotide of claims 1 or 2, or the encoded polypeptide.

10. A method of modulating the genotype of a breast cell, comprising introducing into the breast cell a polynucleotide of claim 1.

11. A method of screening for a candidate therapeutic agent that modulates the expression of a polynucleotide associated the metastatic condition of a breast cell, comprising contacting a cell with an effective amount of a potential agent, and assaying for a change in expression level of a polynucleotide of claims 1 or 2, wherein a change in the expression level is indicative of a candidate therapeutic agent.

12. A polynucleotide comprising a promoter sequence derived from a polynucleotide of claim 1.

13. A host cell comprising the polynucleotide of claim 1 or 12.

14. A gene delivery vechicle comprising a polynucleotide of claim 1 or 12.

15. A polynucleotide of claim 12 and a second polynucleotide operatively linked thereto.

16. A polynucleotide of claim 15, wherein the second polynucleotide encodes an antigenic peptide.

17. A method for inducing an immune response in a subject comprising administering an effective amount of the polynucleotide of claim 1, 12 or 16, to the subject.

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4. Further Comments (Continued):

Claims 1-17 are directed to polynucleotides "comprising or corresponding to" specific decanucleotides set forth by SEQ ID NO, and the application does not comply with the requirements regarding nucleotide sequence disclosures. Claim 6 is directed to polypeptides encoded by the polynucleotides and the description does not disclose such polypeptides. Claims 12-17 are directed to promoters derived from the polynucleotides and the description does not disclose such polypeptides. The polynucleotides disclosed are only decanucleotides, which are incapable of encoding a polypeptide or serving as a promoter.

CORRECTED VERSION*

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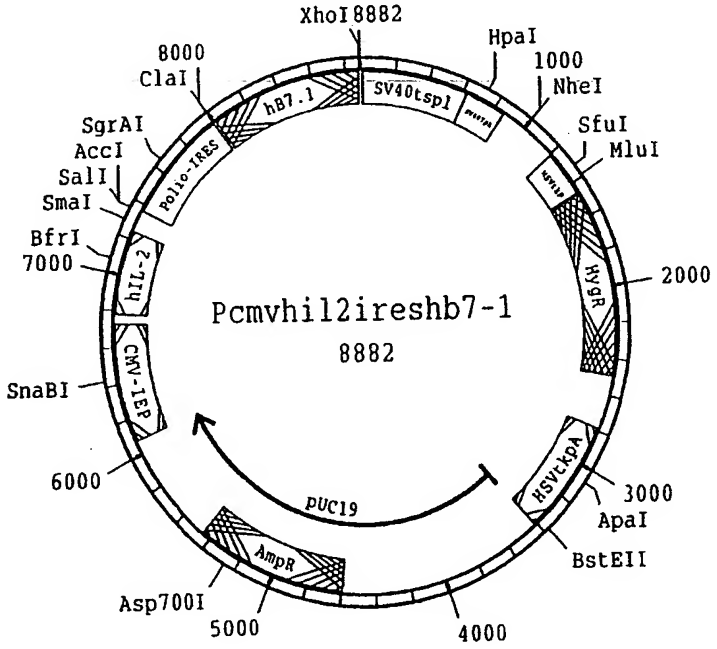

(57) Abstract

An expression vector containing a gene which codes for a transcription or translation product which is therapeutically active, wherein this gene is under the control of an expression control region having the sequence SEQ ID NO:1 or a fragment thereof which comprises at least the bases bp –224 to –214 and/or –197 to –207 from SEQ ID NO:1 is tumour–cell–specific and suitable for in vivo and in vitro ablation or regression of tumour cells.

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Tumour-specific expression control region and the use thereof

The invention concerns a tumour-specific expression control region, vectors containing this region and its use especially for in vivo expression.

The specific expression of tumoricidal foreign genes in tumours is a promising approach for the therapeutic treatment of tumour diseases.

The structure and the promoter analysis of the gene which codes for the human melanoma-inhibiting protein MIA (also referred to as CD-RAP) is known from Bosserhoff, A.K., et al., J. Biol. Chem. 271 (1996) 490-495. MIA is expressed in melanoma cell lines and has growth-inhibiting effects on melanoma cells in vitro (Bogdahn et al., Cancer Res. 49 (1989) 5358-5363; International Application No. WO 95/03328). Furthermore it is known from Bosserhoff and WO 95/03328 that a region of about 500 base pairs of the 5' untranslated region of the MIA gene causes the expression of MIA in malignant melanoma cells.

From Kondo, S., et al., 44th Annual Meeting, Orthopaedic Research Society, March 16-19, 1998, New Orleans, Louisiana, p. 178-30 it is known that IGF-I regulates CD-RAP gene expression via an AP-2 binding site (bp -475 to -458).

From Xie, W.F., 44th Annual Meeting, Orthopaedic Research Society, March 16-19, 1998, New Orleans, Louisiana, p. 207-35 it is known that a 2.2 kb CD-RAP promoter fragment causes expression of lacZ in transgenic mice. A blue colouration shows that all regulatory elements of CD-RAP are present in order to determine the natural CD-RAP expression.

Bosserhoff et al., Proc. Am. Association for Cancer Research Annual Meeting 39 (1980) p. 250, XP002087909, Abstract 1711, and Lederer et al., J. Dermatol. Sci. 16 (1998) Suppl. 1 S48, describe that a region of about 30 bp lying within the region -210 to -1 for the expression control region of the MIA gene is responsible for the tumor-specific expression pattern. However, the authors do not describe the region itself.

Bosserhoff et al., Proc. Am. Association for Cancer Research Annual Meeting 37 (1996) p. 512, Abstract 3565, describe that a 300 bp partial region of the MIA expression control region is melanoma-specifically active. However, the authors do not mention that the MIA promotor has a tumor specificity.

The object of the invention is to improve the MIA promoter so that it is able in vivo to express genes specifically in tumour cells.

The object is achieved by a tumour-cell-specific expression vector containing a gene which codes for a transcription or translation product that is therapeutically active in tumour cells wherein this gene is under the control of an expression control region of the SEQ ID NO:1 or a fragment thereof which comprises at least bp -224 to -214 and/or -197 to -207 from SEQ ID NO:1. Preferably, the segment is bp -224 to -197 of said sequence.

Details of the numbering of the bases (e.g. bp -224) correspond to the numbering system for expression control sequences (upstream numbering) familiar to a person skilled in the art. The following classification applies:

SEQ ID NO:1	upstream numbering system
1	-380
157	-224
184	-197
380	-1

Hence according to the invention "bp -224 from SEQ ID NO:1" means the base or the base pair (bp) 157 from SEQ ID NO:1 in the single or double strand.

Surprisingly, it has turned out that such a vector enables a tumour-specific expression of therapeutically active genes in tumour cells, which enable exclusive expression of therapeutically effective translation- or transcription products in tumour cells.

An expression control region is understood as a nucleic acid region which causes the expression of DNA and hence transcription into mRNA and which usually has a length of 0.5 to 5 kb. Such expression control regions usually contain enhancer regions and promoter regions to which transcription factors or repressors can bind.

Expression control regions can be regulated via binding of activating or repressing factors.

An expression control region according to the invention contains at least the nucleic acid fragment (oligonucleotide) bp - 224 to -197 from SEQ ID NO:1 or active regulatory parts thereof. Such an oligonucleotide contains two highly conserved binding sites, region X (bp -197 to -207) and region Y (bp -224 to -214, TCF-Box). These regulatory nucleic acid fragments (regulatory regions) are also suitable as an expression control region according to the invention in combination with other promoters such as for example the TK promoter, the minimal early SV40 or the CMV immediate early promoter in expression vectors.

A regulatory region is understood as a region which influences expression in a negative or positive manner. If the expression control sequence according to the invention contains a negative regulatory region, the tumour-specific expression is achieved by abolishing such an inhibition in tumour cells and vice versa. The tumour-specific expression can similarly be inhibited by elements that bind to a positive regulatory region (antisense).

For a tumour-specific expression it is important that the distance between the regulatory nucleic acid fragments region X and region Y is not very large. The distance is preferably between 0 and 20 bps.

The human MIA region described in SEQ ID NO:1 as well as corresponding (homologous) MIA regions from mammals such as for example the mouse or rat are suitable as an expression control region. The human MIA sequence is described in the EMBL data base under the number X84707, the murine sequence under the number 485612.

A therapeutically active translation product is understood as a polypeptide (protein) which immediately causes a regression or ablation of tumour cells or results in this via stimulation of the immune system. Suitable genes code for example for tumour suppressor proteins, for proteins which induce apoptosis (e.g. p53), pro-drug activators (suicide genes, such as TK or cytosine deaminase (CDA)), immunostimulators (e.g. cytokines), co-stimulators (e.g. B7-1 or B7-2), CD40 and/or CD40 ligand, or toxic proteins such as choleratoxin.

A therapeutically active transcription product is preferably understood as an antisense sequence (e.g. ribozyme or antisense RNA) which is directed against an oncogene, a gene inhibiting apoptosis or another tumour gene such as MIA (WO 95/03328). Such a transcription product is therapeutically active because it causes a regression or ablation of tumour cells. This can for example be achieved by inhibition of the expression of a tumour gene or of an oncogene.

Hence such therapeutically active transcription or translation products differ from so-called indicator genes like the CAT or luciferase gene which are derived from prokaryotes or insects and are not expressed in a therapeutically active manner in mammals and only serve as an expression test.

Surprisingly, the expression vectors and regulatory regions according to the invention are tumour-specific or tumour-cell-specific and are in particular specific for metastatic cells since the MIA promoter is particularly active in those tumour cells which have become detached from the primary tumour and have thus become mobile.

The therapeutically active transcription product which is preferably an antisense nucleic acid binds in vitro under stringent conditions to a nucleic acid of the sequence SEQ ID NO:1. Such stringent standard conditions and methods for hybridization are known to a person skilled in the art and described for example by Sambrook J., et al. in Expression of clones genes in E. coli" in Molecular Cloning: A laboratory manual (1989), Cold Spring Harbor Laboratory Press, New York, USA and Hames, B.D., and Higgins, S.J., in Nucleic Acid Hybridisation - A Practical Approach, Hames and Higgins publishers (1985), IRL Press. The standard protocols described in this manual are usually used for this. Particular reference is made to Sambrook, Section IX.

Preferred stringent conditions are present when hybridizing in the presence of 1 mol/l NaCl, 1 % SDS and 10 % dextran sulfate and subsequently washing the filter twice for 5 minutes at room temperature in 2 x SSC and carrying out one wash step for 30 minutes. This further wash step can be carried out at 65°C at 0.5 x SSC, 0.1 % SDS, preferably at 0.2 x SSC and 0.1 % SDS and especially preferably at 0.1 x SSC, 0.1 % SDS.

A further subject matter of the invention is a process for the production of a tumour-specific expression vector according to the invention wherein a gene is inserted into a suitable vector in such a way that it is expressed under the control of the described expression control and/or regulatory region according to the invention. Such vectors are expediently vectors which are suitable for gene therapy. Such vectors can be either naked or formulated plasmid DNA (e.g. formulated with transfer reagents such as liposomes) or viral nucleic acids or can be artificial chromosomes.

The tumour-cell-specific expression vectors produced according to the invention can be advantageously used ex vivo or in vivo for gene therapy to regress or ablate tumours and tumour cells such as, e.g., melanoma, colon carcinoma and/or mamma carcinoma cells and metastasising cells derived therefrom. The regression or ablation of tumour cells can take place immediately (for example by expression of p53) or indirectly (by expression of immunostimulating agents such as cytokines (e.g. IL-2, GM-CSF or IL-12) or costimulatory molecules (e.g. B7-1, B7-2, CD40).

A further subject matter of the invention is a process for the production of a pharmaceutical agent for the regression or ablation of primary tumours, residual tumours, metastases and minimal residual disease in vivo or ex vivo of tumour or leukaemia cells which contains an expression vector according to the invention as an essential component, and still another subject matter of the invention is the said pharmaceutical agent itself.

A further subject matter of the invention is a nucleic acid fragment with a length of 10 to 28 bases from the region bp -224 to -197 from SEQ ID NO:1 or a complementary nucleic acid hybridizing under stringent conditions with said fragment. Especially preferred are fragments consisting of bp -207 to -197 or -224 to 214. Such a nucleic acid fragment is suitable as a tumour cell-specific regulatory element in an expression control sequence. Such a nucleic acid fragment is also suitable for the detection and identification of substances binding to this nucleic acid fragment. Such detection methods are described for example in the US patent No. 5,578,444, US patent No. 5,716,760 and the Canadian patent No. 2,112,130. In these methods the nucleic acid fragment is covalently bound to the DNA and a binding partner of the nucleic acid fragment influences the DNA protein binding.

A further subject matter of the invention is based on the binding of elements that can bind in a complementary manner to the nucleic acid fragment (bp -197 to -224) (preferably under physiological conditions e.g. in tumour cells) in order to inhibit the expression of the MIA promoter. Such elements are for example antisense RNA, ribozyme, PNA or chimeraplasts and can be used in a modified form in the same sense as described above and/or used directly (without requiring an expression vector as a vehicle).

Consequently a further subject matter of the invention is a first nucleic acid fragment which specifically binds under physiological conditions to a second nucleic acid fragment of sequence SEQ ID NO:1 or a fragment thereof which comprises at least the bases from bp -224 to -197 from SEQ ID NO:1 and forms a triple helix with the double-stranded second nucleic acid fragment in the region of the bases bp -224 to -197 from SEQ ID NO:1 or contains one or several point mutations in the region of the bases bp -224 to -197 from SEQ ID NO:1. Such a first nucleic acid fragment is preferably 10 to 40 nucleotides long and can be used to inhibit MIA expression in tumour cells.

The nucleic acid fragment (preferably factor X) represents a conserved expression control element. The mutation of a few bases (preferably 1 to 3 bases) inhibits or reduces the expression activation of the promoter element located downstream. Therefore for a therapeutic application it is preferable to introduce antisense RNA, ribozyme, PNA or chimeraplasts into tumour cells which cause such an inhibition or mutation in the MIA promoter and consequently inhibit MIA expression in such cells and as a result reduce or abolish the metastasising potential of these tumour cells (preferably melanoma, mamma carcinoma, colon carcinoma).

According to the invention a chimeraplast is understood as a chimeric DNA-RNA hybrid molecule (expediently 60 to 90 bp) which is able to bind sequence-specifically to DNA and induce the point mutations described above. Such chimeraplasts and the production thereof are described in the US patent No. 5,565,350. Their in vivo application is described by Kren, B.T., et al., Nature Medicine 4 (1998) 285-290.

An expression vector according to the invention can also be used advantageously for an ex vivo purging of leukaemia cells or tumour cells in autologous bone marrow transplantations. Since the expression vector is active specifically in

tumour cells, this would enable otherwise non-detectable tumour cells to be labelled in autologous transplantation preparations. It is expedient to carry this out by using a suitable tumour cell marker as described for example in WO 95/06723. It is particularly advantageous to use the LNGFR gene as a marker gene for tumour cells from autologous bone marrow transplantation preparations. Additionally an expression vector according to the invention is used which in this case does not code for a therapeutically active product but rather for a selectable indicator gene. The preferred LNGFR gene expresses the LNGF receptor which labels the cell surface and is reliably detected by means of antibodies. This enables the undesired tumour cells to be removed from autologous bone marrow preparations. Analogously suicide genes, toxin genes and apoptosis-inducing genes can also be introduced and used to kill the tumour or leukaemia cells for purging.

The invention whose protective scope results from the claims is further elucidated by the following examples, publications, the sequence protocol and the figures. The described procedures are understood as examples which still describe the subject matter of the invention even after modifications.

Description of the Figures

Fig. 1 Restriction map of the plasmid pCMVh12-bgh-cat.
Fig. 2 Restriction map of the plasmid pLT1.
Fig. 3 Restriction map of the plasmid pCMVhi12ireshb7-1.

Example 1

Construction of the expression vectors

1.1 Cat reporter gene as control:

Based on the reporter gene plasmid pCMVh12-bgh-cat (Fig. 1) the construct pMIA380h12-bgh-cat is prepared as follows: The CMV promoter is removed from pCMVh12-bgh-cat by a PstI/XhoI double digestion. The shortened MIA promoter fragment (0 to -380 bp) is amplified from pBL-MIA1386 (which contains the entire MIA promoter region described in Bosserhoff, A.K., et al., J. Biol. Chem. 271 (1996) 490-495) by means of PCR using appropriate primers which carry overhanging ends with the PstI/XhoI sites and cloned into the PstI/XhoI cleavage site.

1.2 Prodrug-activatable suicide gene HSV-TK:

Based on the construct pMIA380h12-bgh-cat the construct pMIA380h12-bgh-HSV-TK is prepared as follows: The cat gene is removed from pMIA380h12-bgh-cat by a NotI digestion. The HSV-TK gene is amplified from pLT1 (Fig. 2) by means of PCR and primers against the 5' and the 3' end of the gene, which carry overhanging ends with the NotI site and is cloned into the NotI cleavage site.

1.3. Immunostimulatory IL-2 gene:

Based on the construct pMIA380h12-bgh-cat the construct pMIA380h12-bgh-hIL-2 is prepared as follows: The cat gene is removed from pMIA380h12-bgh-cat by a NotI digestion. The human IL-2 gene is amplified from pCMVhIL2IREShB7-1 (Fig. 3) by means of PCR and primers against the 5' and the 3' end of the cDNA, which carry overhanging ends with the NotI sites and is cloned into the NotI cleavage site.

1.4 Immunostimulatory GM-CSF gene:

Based on the construct pMIA380h12-bgh-cat the construct pMIA380h12-bgh-GM-CSF is prepared as follows: The cat gene is removed from pMIA380h12-bgh-cat by a NotI digestion. GM-CSF is described in EP-B 0 202 300 and EP-B 0 188 479 (see also (Dranoff, G., et al., Proc. Natl. Acad. Sci. USA 90 (1993) 3539-3543). The GM-CSF gene is amplified by means of PCR and primers against the 5' and the 3' end of the cDNA, which carry overhanging ends with the NotI sites and is cloned into the NotI cleavage site.

Example 2

Transfection of the aforementioned vectors into a murine B16 melanoma cell line

The murine B16 melanoma cell line (ATCC# CRL 6322) is cultured in DMEM + 10 % FCS and L-glutamine. DOSPER (Roche Diagnostics GmbH, Mannheim, DE) is used as the transfection reagent according to the manufacturer's instructions; serum free transfection medium.

pCMVh12-bgh-cat or pMIA380h12-bgh-cat:
The B16 cells are transfected; the cat activity is measured after 2 to 3 days. The test for cat activity is carried out with a cat ELISA (Roche Diagnostics GmbH, Mannheim, DE) according to the manufacturer's instructions and the results obtained for the shortened MIA promoter fragment (example 1.1) are compared with those of the CMV promoter.

pCMVh12-bgh-IL-2 or pMIA380h12-bgh-IL-2:
The B16 cells are transfected; the IL-2 activity is measured after 2 to 3 days. The test for IL-2 activity is carried out with an IL-2 ELISA (Roche Diagnostics GmbH, Mannheim, DE) according to the manufacturer's instructions and the results obtained for the shortened MIA promoter fragment (example 1.1) are compared with those of the CMV promoter.

pCMVh12-bgh-HSV-TK or pMIA380h12-bgh-HSV-TK:
The transfection into the B16 cells is carried out with an Asp700I linearized plasmid. The plasmid pCDNA3 (Invitrogen) which contains a NeoR expression cassette is co-transfected in a 10-fold molar deficit. It is selected for 2 - 3 weeks with 50 µg/ml G418. Subsequently HSV-TK gene-positive B16 melanoma cell clones are isolated by limited dilution and PCR screening of the individual clones obtained.

The in vitro test for HSV-TK activity is carried out with Ganciclovir (Cymeven®, Syntex/10 µg/ml; Beck, C., et al., Human Gene Therapy 6 (1995) 1525-1530); HSV-TK expressing positive cells die. The results obtained for the shortened MIA promoter fragment (example 1.1) are compared with those for the CMV promoter. A stable B16 melanoma cell line is set up for pMIA380h12-bgh-GM-CSF analogously to the HSV TK gene; positive clones are characterized by PCR and a GM-CSF ELISA (endogenous).

Example 3

Injection of the stable pMIA380h12-bgh-HSV-TK and pMIA380h12-bgh-GM-CSF transfected B16 melanoma line in syngenic C57B16 mice

HSV-TK:
1×10^6 B16/HSV-TK cells are washed in PBS and injected subcutaneously in a volume of 200 µl into the abdominal wall of C57B16 mice (Fidler, I.J., Cancer

Research 35 (1975) 218-224). The stably transfected tumour has started to grow after 4 - 6 days.

Variant: 1 x 10^5 B16/HSV-TK cells are washed in PBS and injected intravenously into the C57B16 mice. After 10 - 14 days the lung metastases have started to grow.

The B16 melanomas expressing HSV-TK but not the non-expressing B16 melanomas are killed by GCV doses (2 x daily; for 5 days; 150 mg/kg GCV in 200 µl 0.9 % NaCl solution (Beck, C., et al., Human Gene Therapy 6 (1995) 1525-1530) or only 0.9 % NaCl solution as a control). The mice are sacrificed, dissected and examined histologically; the GCV-treated animals are compared with the non-treated animals.

GM-CSF(3):

The syngenic C57B16 mice are vaccinated by subcutaneous injection of 5 x 10^5 live pMIA380h12-bgh-GM-CSF transfected B16 cells into the abdomen. After 7 - 14 days the animals are challenged by subcutaneously injecting 5 x 10^5 live, non-transduced B16 melanoma cells into the back. The mice are sacrificed, dissected and examined when tumours of 2 - 3 cm in size occur or after at most 100 days. The mice which have received an injection of B16 cells stably transfected with the GM-CSF gene under MIA promoter control are compared with mice that have received untransfected B16 cells.

Example 4

Injection of the plasmids pMIA380h12-bgh-HSV-TK and pMIA380h12-bgh-GM-CSF as a formulation with DOTAP (Roche Diagnostics GmbH, DE) into established B16 melanoma tumours or into normal muscle tissue of syngenic C57B16 mice

HSV-TK:

1 x 10^6 B16 cells are washed in PBS and injected subcutaneously in a volume of 200 µl into the abdominal wall of syngenic C57B16 mice. The tumour has started to grow after 4 - 6 days. pMIA380h12-bgh-HSV-TK is formulated with DOTAP and injected into the pre-formed B16 melanoma tumours or into healthy muscle tissue. Ganciclovir is administered after 2 - 3 days (2 x daily; for 5 days; 150 mg/kg GCV in 200 µl 0.9 % NaCl solution or only 0.9 % NaCl solution as a control); the tumour cells transfected by the HSV-TK gene and therefore expressing HSV-TK are killed

by the prodrug activation but not the non-expressing cells (normal body cells or normal body cells which have been transduced by pMIA380h12-bgh-HSV-TK in which the MIA promoter is, however, not activated i.e. HSV-TK is also not expressed). The mice are sacrificed, dissected and examined; the GCV-treated animals are compared histologically with non-treated animals. The treated tissue is also compared by means of PCR and RT-PCR for the presence or expression of the transgenic HSV-TK gene.

GM-CSF:

1×10^6 B16 cells are washed in PBS and injected subcutaneously in a volume of 200 µl into the abdominal wall of syngenic C57B16 mice. The tumour has started to grow after 4 - 6 days. pMIA380h12-bgh-GM-CSF is formulated with DOTAP and injected into the pre-formed B16 melanoma tumours or into muscle tissue. After 7 - 14 days the mice are sacrificed, dissected and histologically examined for the immunostimulatory effect of the GM-CSF gene (tumour size, macrophage infiltration) and for the presence of the plasmid DNA by means of PCR or for GM-CSF expression by means of RT-PCR. The mice which have received pMIA380h12-bgh-GM-CSF/ DOTAP into the pre-formed B16 melanoma tumours are compared with mice which have received only the empty vector plasmid or an injection into muscle tissue.

Example 5

Influence of mutations in the region X on MIA expression

Mutations are introduced by site-directed mutagenesis (site directed mutagenesis kit, Clontech) in region X of the expression control sequence according to Table 1 in a reporter plasmid which contains the luciferase gene under the control of the MIA promoter fragment according to SEQ ID NO:1 and expression in malignant melanoma cells (MM, B16) and non-melanoma cells (nonMM, HeLa) is examined. The result is shown in Table 1.

The reporter plasmid is prepared by inserting the MIA promoter fragment as well as the luciferase indicator gene via HindIII/BglII into the vector pGL3 basic (Promega GmbH, Mannheim, DE).

Table 1

Influence of mutations in region X on the MIA expression

Codons from region X	MM	non-MM
TAG GCA TTT TCT	+++	-
mut 1 --X -XX XXX ---	-	-
mut 3 --- X-X --- ---	-	-
mut 4 --X X-X --- ---	-	-
mut 5 --X --- --- ---	++	-
mut 6 --- --X --- ---	+	-

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US Patent No. 5,578,444

US Patent No. 5,716,760

WO 95/03328

WO 95/06723

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Patent Claims

1. Tumour cell-specific expression vector containing a gene which codes for a transcription or translation product that is therapeutically active in tumour cells, wherein this gene is under the control of an expression control region with the sequence SEQ ID NO:1 or a fragment thereof which comprises at least the bases bp -224 to -214 and/or -197 to -207 from SEQ ID NO:1.

2. Expression vector as claimed in claim 1, wherein the therapeutically active transcription or translation product causes tumour regression, tumour ablation or immunostimulation in tumour cells.

3. Expression vector as claimed in claim 1, wherein the therapeutically active transcription product is an antisense nucleic acid or a ribozyme which binds in vitro under stringent conditions to a nucleic acid of sequence SEQ ID NO:1.

4. Expression vector as claimed in claim 1 or 2, wherein the therapeutically active translation product is a prodrug-activating, an apoptosis-inducing, tumour-suppressing, immunostimulating, co-stimulatory or toxic polypeptide.

5. Process for the production of a tumour-specific expression vector as claimed in claims 1 to 4, wherein the therapeutically active gene is inserted in such a way that it is expressed under the control of the expression control region.

6. Use of an expression vector as claimed in claims 1 to 4 for the regression or ablation of primary tumours, residual tumours, metastases and minimal residual disease in vivo or ex vivo of tumour and leukaemia cells.

7. Process for the production of a pharmaceutical agent for the regression or ablation of primary tumours, residual tumours, metastases and minimal residual disease in vivo or ex vivo of tumour and leukaemia cells, wherein an expression vector as claimed in claims 1 to 4 is used as an essential component of the agent.

8. Pharmaceutical agent for the regression or ablation of primary tumours, residual tumours, metastases and minimal residual disease in vivo or ex vivo of tumour and leukaemia cells, wherein it contains an expression vector as claimed in claims 1 to 4 as an essential component.

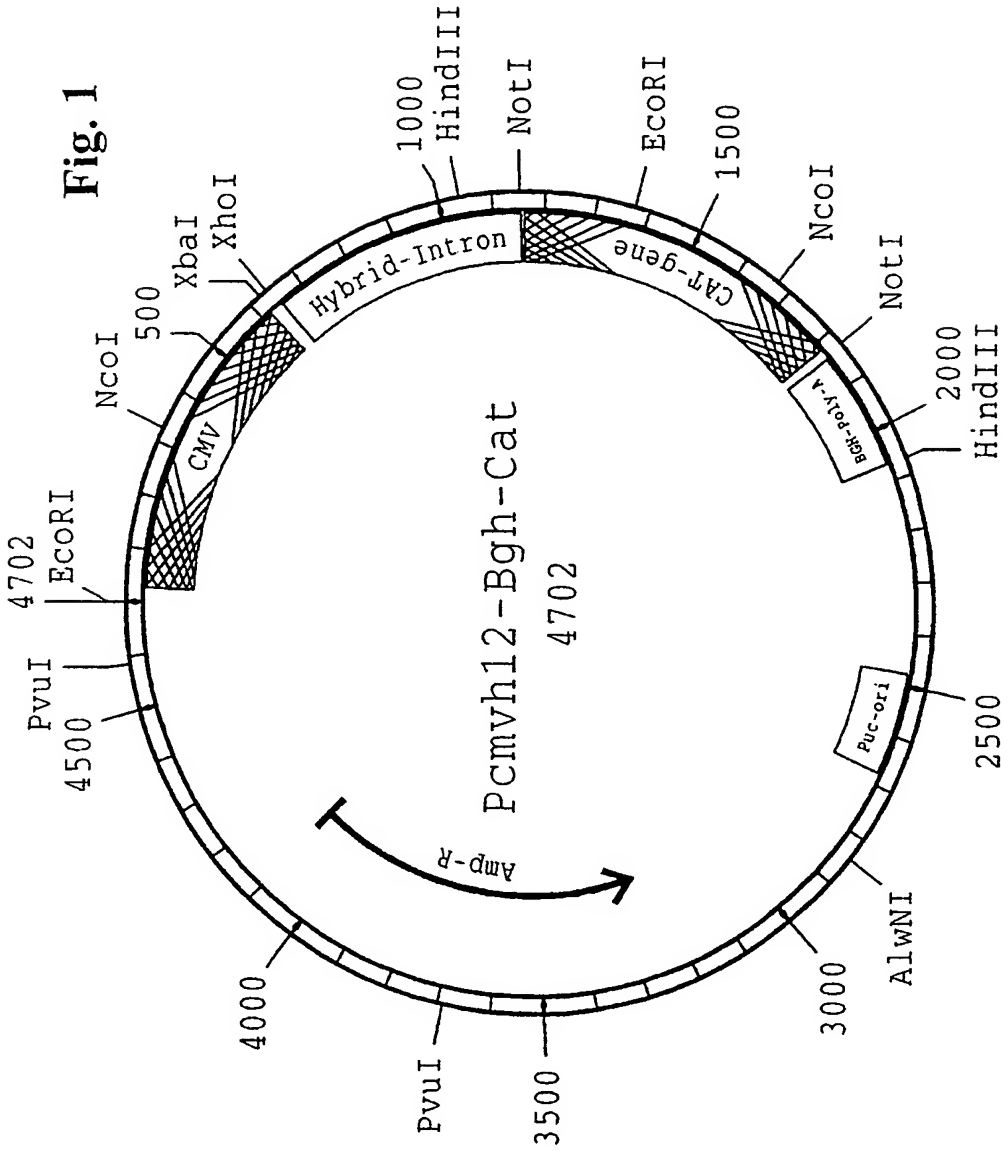
9. Nucleic acid fragment with a length of 10 to 30 bases, wherein the fragment hybridizes under stringent conditions with the base sequence -224 to -197 from SEQ ID NO:1 or with a nucleic acid which is complementary thereto.

10. Use of a nucleic acid fragment of sequence SEQ ID NO:1 or a fragment thereof which comprises at least the bases bp -224 to -197 from SEQ ID NO:1 in a method for the detection of a DNA-protein binding, wherein the nucleic acid fragment is covalently bound to the DNA and a binding partner of the nucleic acid fragment influences the DNA-protein binding.

11. Nucleic acid fragment which specifically binds under physiological conditions to a second nucleic acid fragment of sequence SEQ ID NO:1 or a fragment thereof which comprises at least the bases bp -224 to -197 from SEQ ID NO:1 and forms a triple helix with the double-stranded second nucleic acid fragment in the region of the bases bp -224 to -197 from SEQ ID NO:1 or contains one or several point mutations in the region of the bases bp -224 to -197 from SEQ ID NO:1.

12. Use of a first nucleic acid fragment as claimed in claim 11 for the inhibition of the MIA expression in tumour cells.

Fig. 1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Hybrid-Intron
CAT-gene
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Amp-R
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EcoRI
1500
NcoI
NotI
2000
HindIII
2500
AlwNI
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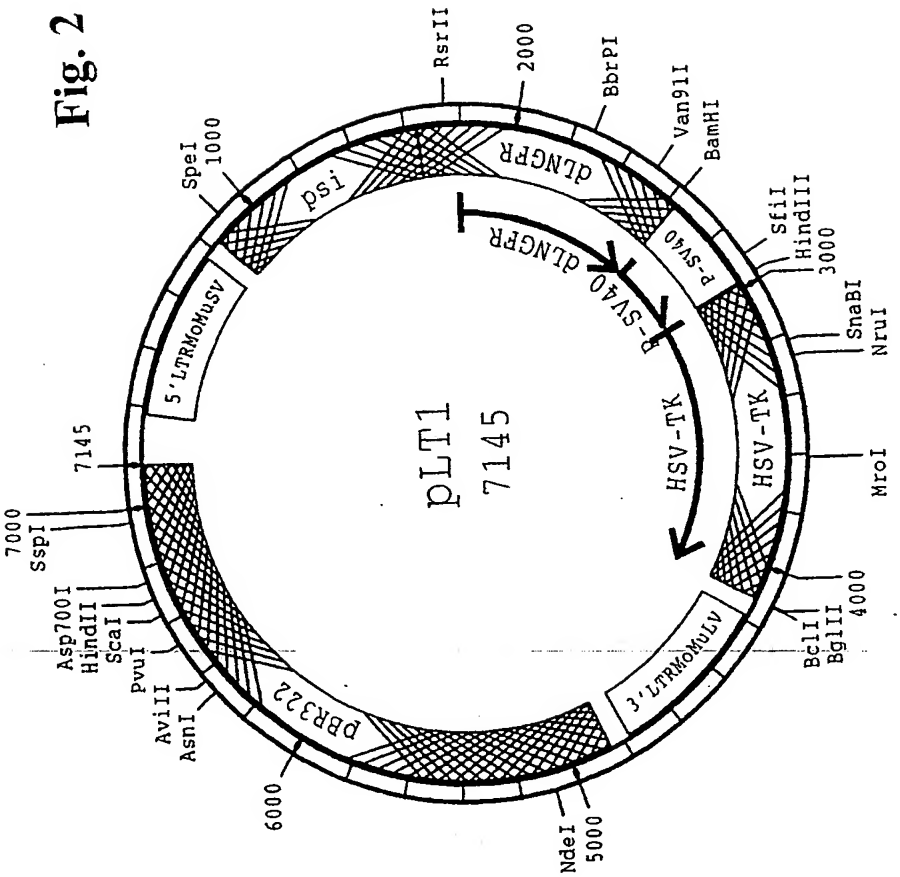
XhoI
4702
EcoRI
PvuI
4500

Fig. 2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BbrPI
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BamHI
SfiI
HindIII
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SnaBI
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MroI
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BglII
3'LTRMoMuLV
NdeI
5000
pBR322
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AvaII
AsnI
PvuI
ScaI
HindII
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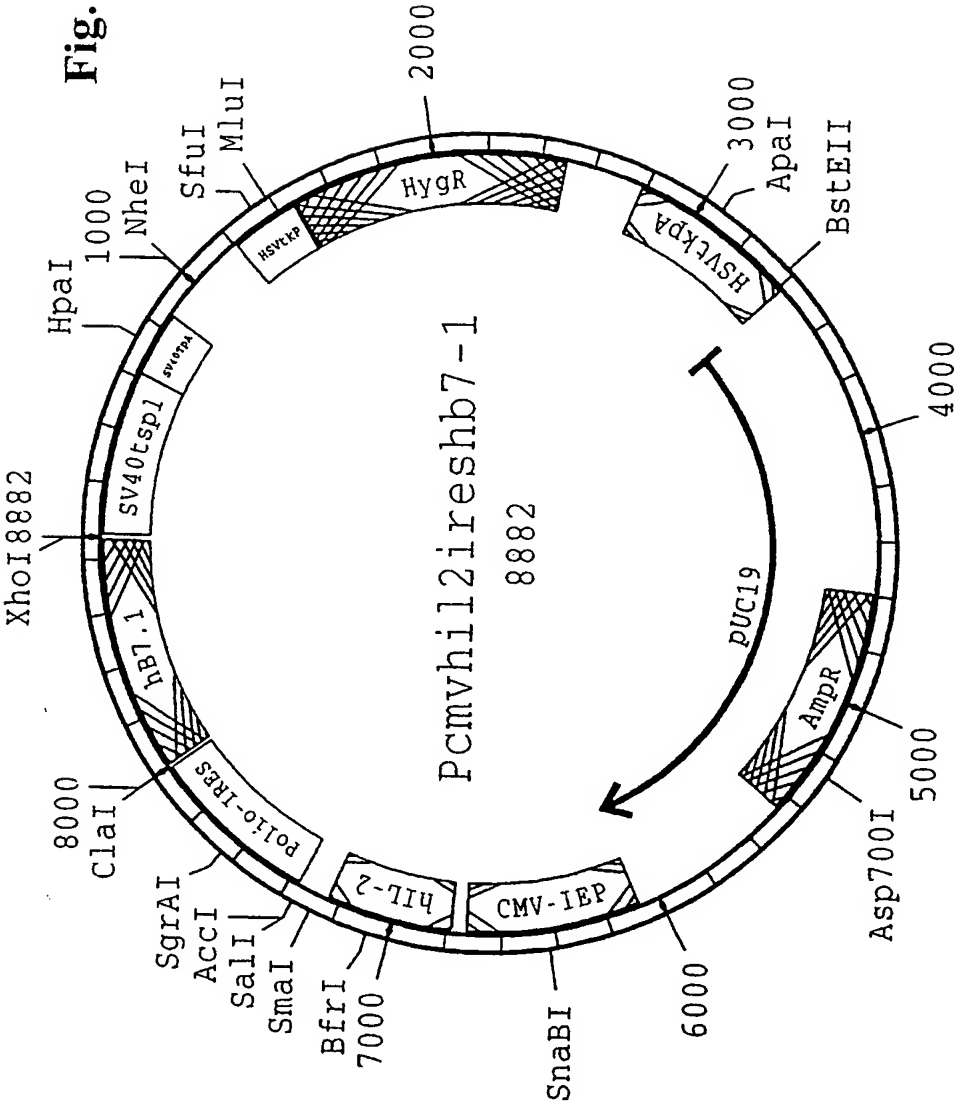
isd
SpeI
1000
dLNGFR
P-SV40
HSV-TK

Fig. 3



SEQUENCE LISTING

(1) GENERAL INFORMATION:

(i) APPLICANT:
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(F) POSTAL CODE (ZIP): D-68305
(G) TELEPHONE: 08856/60-3446
(H) TELEFAX: 08856/60-3451

(ii) TITLE OF INVENTION: Tumour-specific expression control region and the use thereof

(iii) NUMBER OF SEQUENCES: 1

(iv) COMPUTER READABLE FORM:
(A) MEDIUM TYPE: Floppy disk
(B) COMPUTER: IBM PC compatible
(C) OPERATING SYSTEM: PC-DOS/MS-DOS
(D) SOFTWARE: PatentIn Release #1.0, Version #1.30B (EPO)

(2) INFORMATION FOR SEQ ID NO: 1:

(i) SEQUENCE CHARACTERISTICS:
(A) LENGTH: 383 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: double
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: other nucleic acid
(A) DESCRIPTION: /desc = "expression control region
Base 1 = -380 Base 380 = -1"

(xi) SEQUENCE DESCRIPTION: SEQ ID NO: 1:

CTTTACAGGC TCCTCCGCTT CTGTGGCCAG AGGGGACAGC GGAGGACCCC AGGTACCTAA 60

GCCAACTCAA GAGAAGATGG AATTGAATAT TTCAACCACC TTATCTAGGC CTCTGTGATT 120

GTTGAGGAGG GGGCTGTCAC TGGGAAAGTT GTGAGCTGCT TTGGACCTTA TCTGGGAATT 180

TCCTTGGGCC TTACAGCTTT ACCCTATCCT TGAAATGGTT CTGGTTTCAT AGCAACTTCT 240

AGGTGGTGTG GGCGAAGTTT GGGACTGGTT TAGGGCGGGG ACAAGACCAA GAACACAAGT 300

TTCCTTGTAC GGGAGAGAGG GAGGGGAGGA AATTGGAGAC CCCAGCACCC CCTTGCTCAC 360

TCTCTTGCTC ACAGTCCACG ATG 383

INTERNATIONAL SEARCH REPORT

Interna l Application No
PCT/EP 99/02031

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 C12N15/12 C07K14/47 C12N15/85 A61K48/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 C07K C12N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate of the relevant passages	Relevant to claim No.
X	BOSSERHOFF A.K. ET AL: "Regulation of melanoma-specific expression of the MIA gene by distinct promoter elements" PROCEEDINGS OF THE AMERICAN ASSOCIATION FOR CANCER RESEARCH ANNUAL MEETING, vol. 39, March 1998 (1998-03), page 250 XP002087909 WASHINGTON US * Abstract No.: 1711 * ---	9-12
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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 January 2000	19/01/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P B 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl. Fax: (+31-70) 340-3016	De Kok, A

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INTERNATIONAL SEARCH REPORT

Interna l Application No
PCT/EP 99/02031

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication where appropriate of the relevant passages	Relevant to claim No.
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Information on patent family members

Internal Application No
PCT/EP 99/02031

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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